# HQ-100
# COMMUNICATIONS
# RECEIVER

TECHNICAL
DESCRIPTION
AND
OPERATING
INSTRUCTIONS

HAMMARLUND

The Hammarlund Manufacturing Co., Inc.
460 West 34th Street, New York 1, N. Y.

International Division: 13 East 40th Street, New York 16, N. Y.

# THE
# HQ-100, HQ-100C, HQ-100E
# COMMUNICATIONS
# RECEIVERS

INSTRUCTION AND SERVICE INFORMATION

ESTABLISHED 1910

In order to receive the full unconditional 90-day warranty against defective material and workmanship in this receiver, the warranty card must be filled out and mailed within two weeks of purchase. Please refer to serial number of warranty in correspondence.

**THE HAMMARLUND MANUFACTURING CO., INC.**
460 West 34th Street : : : : New York 1, N.Y.


***Figure 1. The HQ-100 Receiver***

TUBE COMPLEMENT

| Symbol | Type | Tube | Function |
|---|---|---|---|
| V1 | 6BZ6 | Pentode | RF Amplifier |
| V2 | 6BE6 | Pentagrid Converter | Mixer |
| V3 | 6C4 | Triode | HF Oscillator |
| V4A | 1/2 12AX7 | Triode | First AF Amplifier |
| V4B | 1/2 12AX7 | Triode | Q-Multiplier - BFO |
| V5 | 6BA6 | Remote Cutoff Pentode | First IF Amplifier |
| V6 | 6BA6 | Remote Cutoff Pentode | Second IF Amplifier |
| V7 | 6AL5 | Twin Diode | Detector, Series Noise Limiter |
| V8 | 6AQ5 | Beam Power Amplifier | Audio Power Output |
| V9 | 0B2 | Gas Filled Diode | Voltage Regulator |
| V10 | 5Y3 | Twin Diode | Rectifier |

# INTRODUCTION

The Hammarlund HQ-100 is an all-new communications receiver representing entirely new concepts in electrical and mechanical design. It will provide years of top performance with minimum maintenance. The HQ-100 has a self-contained power supply operating from a 60 cps, 105-125 volt AC source. The Hammarlund HQ-100-C incorporates a telechron automatic electric clock-timer in its design. The export model, HQ-100-E, will operate from a 50-60 cps, 115-230 volt AC source. Because of the power supply operating frequency of the export model, the automatic timer and clock is not incorporated in this model.

The HQ-100 is a superheterodyne receiver with a frequency coverage continuously tunable from 540 KCS to 30 MCS with extremely fine control in separation of crowded signals. A very high signal-to-noise ratio plus the famous Hammarlund noise limiter circuit, permits full use of the receiver's excellent sensitivity on the weakest signals. A Q-Multiplier is provided for varying the selectivity of the receiver.

Electrical band spread tuning is provided with direct calibration every 10 KCS on 80, 40, and 20 meter bands; every 20 KCS on the 15 meter band and every 50 KCS on the 10 meter band. In addition, an arbitrary band spread logging scale is provided for use throughout the tuning range of the receiver.

A new audio output circuit feature is the Auto-Response which automatically narrows and widens the frequency range of the audio output, depending upon the gain required. This feature permits the receiver to be used as a high-fidelity receiver on stronger signals, while providing the sharp cutoff required in receiving communication signals. A second advantage of the Hammarlund Auto-Response is the rapid damping of the audio power in the speaker voice coil which greatly minimizes undesirable speaker "hangover." The receiver may be used with either speaker or headphones. Fast acting AVC maintains a constant audio level. Adequate filtering practically eliminates AC power ripple.

The HQ-100 is equipped with a stable beat frequency oscillator which provides the operator with a continuous range of audio tones when receiving telegraph, code signals, or excellent single-side band reception.

An "S" meter is provided to obtain accurate readings on received phone signals and to assure "on-the-nose" tuning. A send-receive switch is provided to silence the receiver while transmitting.

Large, comfortable controls in logical groupings are provided for greatest operating ease. The new futuristic front panel is clearly marked to permit full attention to the operating at hand.

The HQ-100 was designed with you in mind. You'll have many hours of pleasure and use in operating this truly fine communications instrument.

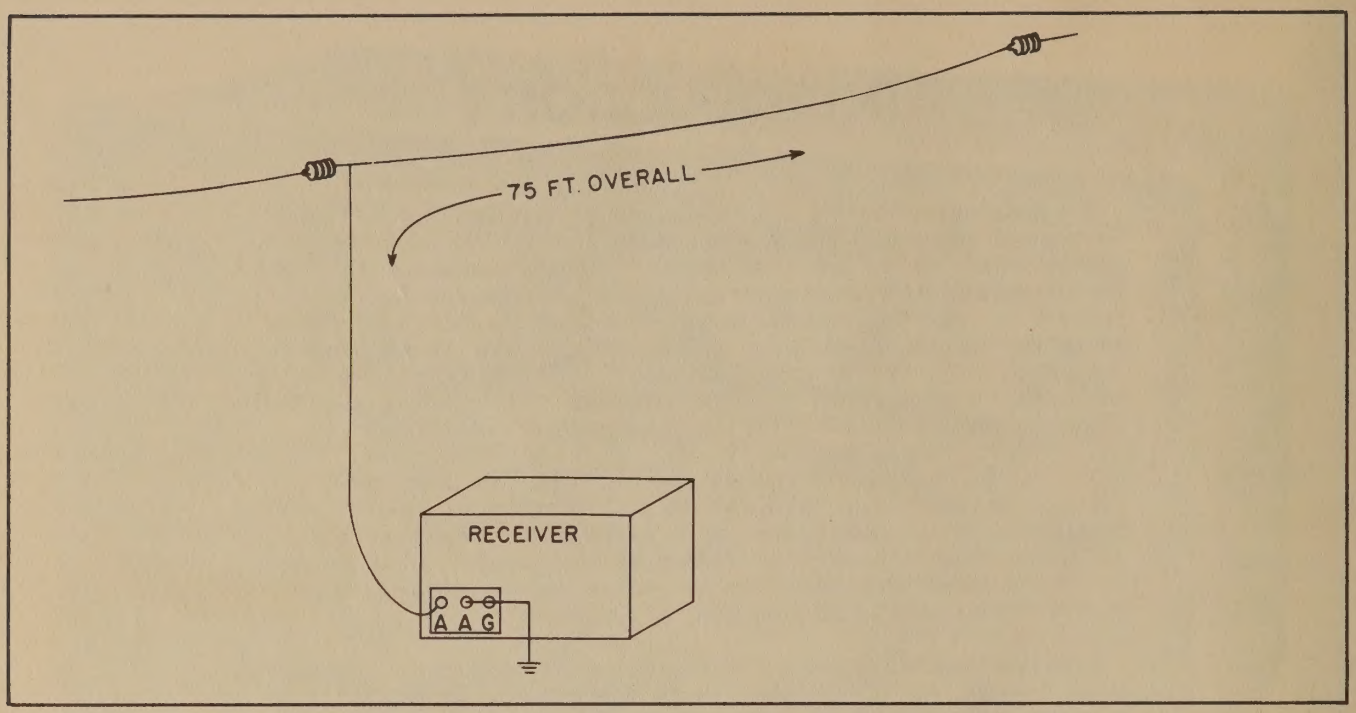



*Figure 2. Installation of Single-wire Antenna*

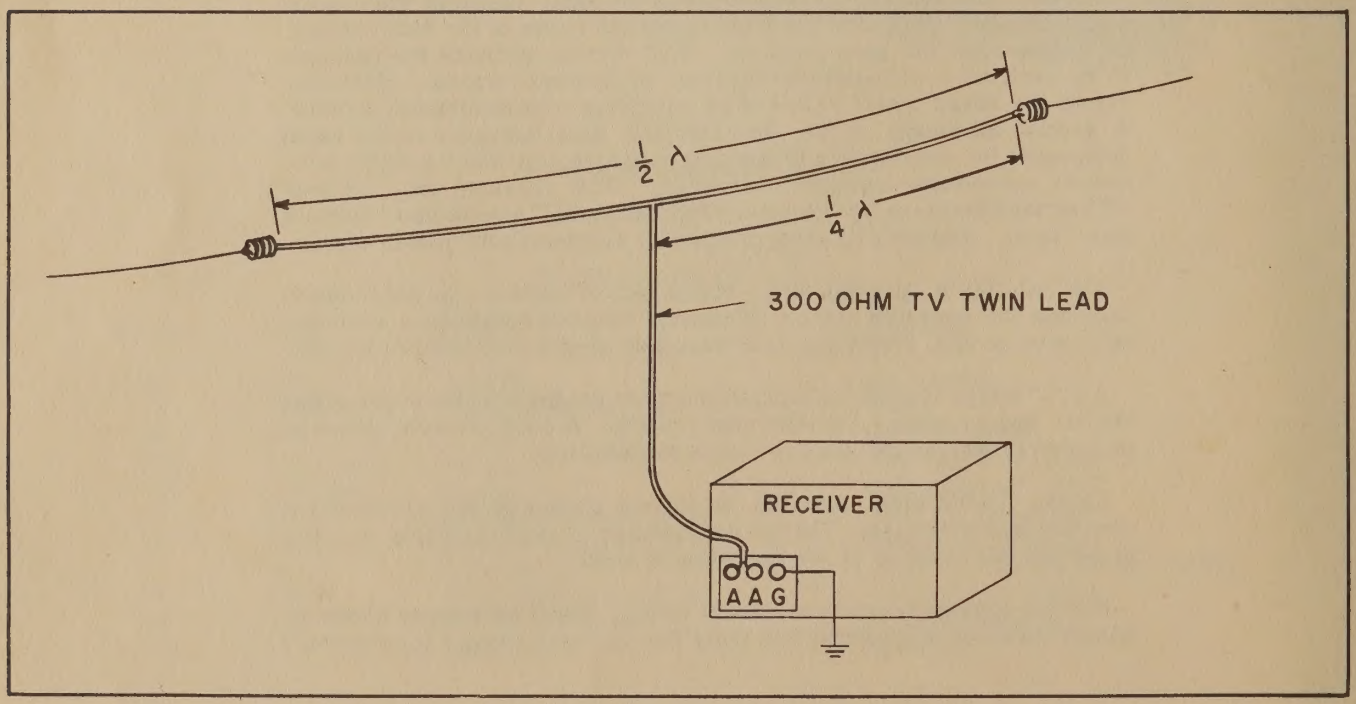



*Figure 3. Installation of Folded Dipole Antenna*

# INSTALLATION

## UNPACKING

Unpack the receiver carefully. Make sure the tubes, associated tube shields and pilot lamps are in place.

## SPEAKER CONNECTION

Connect a 3.2 ohm permanent magnet dynamic speaker (Hammarlund S-100 Speaker) to the two terminals marked SPKR. on the rear of the chassis. (Note Figure 4). For best performance do not place speaker on top of receiver cabinet.

## POWER CONNECTIONS

Before inserting attachment plug into power outlet, make certain power source is of proper voltage and frequency. (Refer to paragraph one of INTRODUCTION.)

## INSTALLING ANTENNA

The HQ-100 is designed to operate with a single wire or a balanced type antenna. The front panel antenna trimmer control (Figure 5) permits a good match to most antennae systems of 50 to 600 ohms.

For general coverage, single wire antennae of 20 to 50 feet length will provide surprisingly good reception. A long single wire outdoor antenna, such as shown in Figure 2, will generally provide entirely satisfactory performance. This wire may be 50 to 150 feet long.

For best reception, the antenna should be isolated as much as possible from neighboring objects and at right angles to power lines or busy highways so as to minimize possible interference pickup.

Optimum performance on a particular amateur band or other narrow tuning range will be obtained by using a tuned half-wave dipole or folded dipole fed with 300 ohm transmission line or other suitable lead-in, as shown in Figure 3.

To tune the one-half wave length dipole, the following formula for the length of the antenna may be used:

$$\text{Length (feet)} = \frac{463}{\text{Freq. (MCS)}}$$

Each half (1/4 wave length) is half the length found from the above formula.

A good ground, although not always necessary, will generally aid in reception and reduce stray line hum. Reversal of polarity of power cord plug may possibly further reduce line hum in some locations.

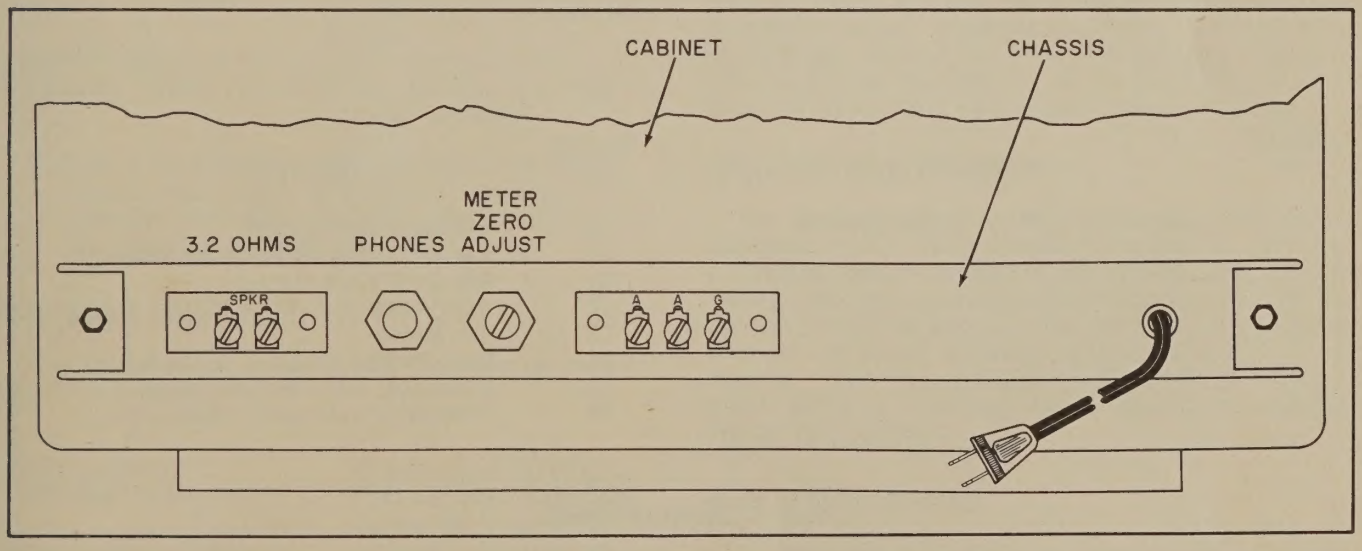
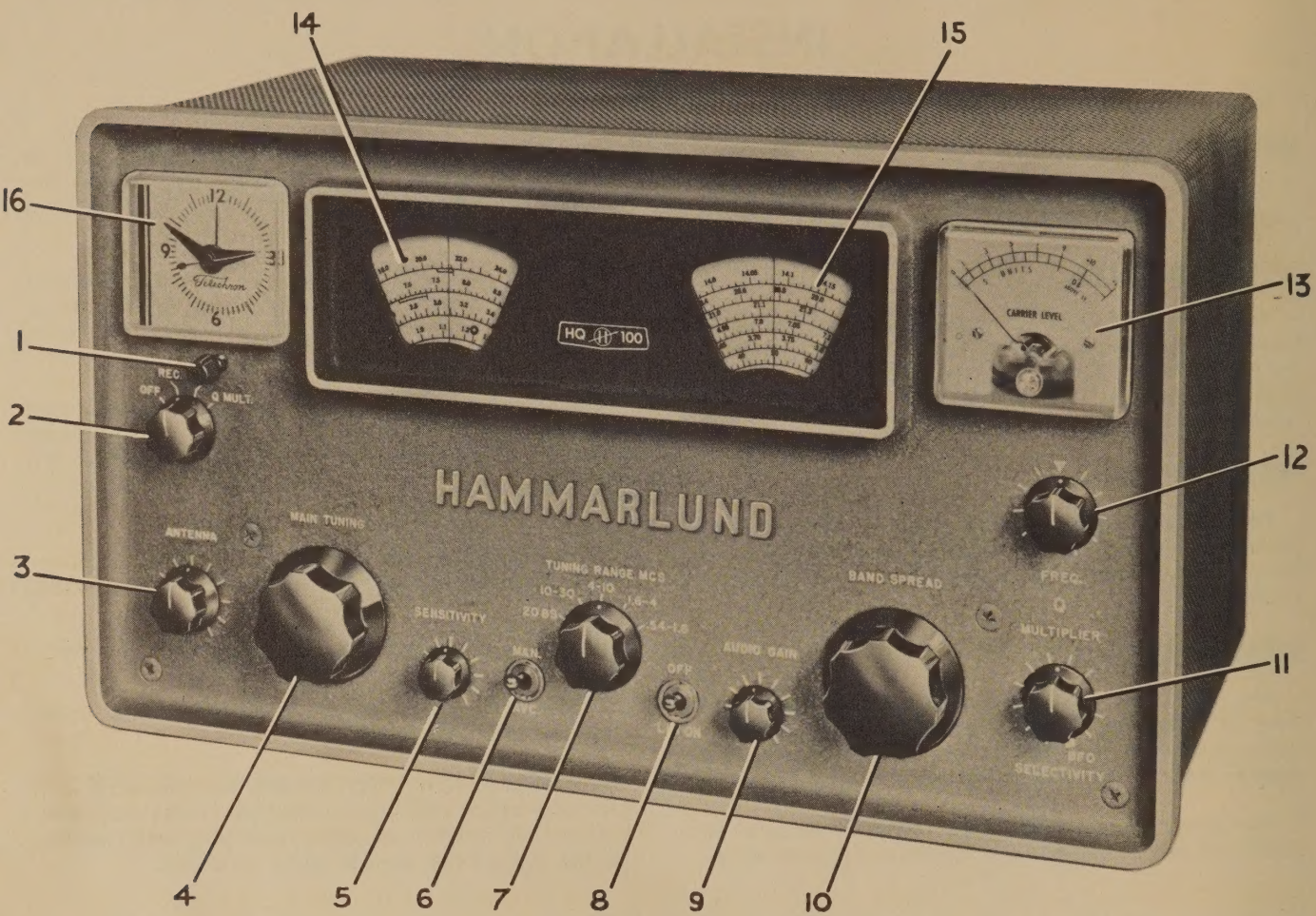



*Figure 4. Connection Points at Rear of Chassis*




| INDEX NO. | CONTROL | INDEX NO. | CONTROL |
|---|---|---|---|
| 1 | Automatic Clock-Timer Control | 9 | AUDIO GAIN Control |
| 2 | Function Switch | 10 | Electrical BAND SPREAD Control |
| 3 | ANTENNA Trimmer | 11 | SELECTIVITY Control |
| 4 | MAIN TUNING Control | 12 | Frequency Control |
| 5 | SENSITIVITY Control | 13 | "S" Meter |
| 6 | MAN. -AVC Switch | 14 | Main Tuning Dial |
| 7 | Band Selector Switch | 15 | Electrical Band Spread Dial |
| 8 | Noise Limiter Switch | 16 | Telechron Automatic Clock-Timer |

***Figure 5. Location of Controls***

# OPERATION

Basically, all that is necessary to operate a radio receiver are the tuning and volume controls. The additional controls found on the front panel of a communications receiver such as the HQ-100, control functions which greatly improve operating performance and make possible reception of otherwise unintelligible signals.

## NORMAL CONTROL SETTINGS

For "normal" operation such as broadcast, short wave listening, etc., the position of the various controls should be as follows:

| | |
|---|---|
| Function Switch | Receive (REC.) |
| ANTENNA Trimmer | Tune for highest "S" meter reading on signal. |
| MAIN TUNING Control | Tune for highest "S" meter reading on signal. |
| SENSITIVITY Control | Fully clockwise |
| MAN.-AVC Switch | AVC |
| Band Selector (TUNING RANGE MCS) Switch | Set to desired frequency range. |
| Noise Limiter Switch | OFF |
| AUDIO GAIN Control | Adjust for proper level. |
| BAND SPREAD Control | Set counterclockwise to "100" on band spread dial. |
| SELECTIVITY Control | BFO position * |
| Frequency (FREQ.) Control | Set pointer to triangular marking. |

* Setting the SELECTIVITY control to BFO with the function switch in receive position disconnects the Q-Multiplier from the IF allowing normally broad IF bandpass.

## CODE SIGNAL RECEPTION

For reception of code signals, the controls should be set as follows:

| | |
|---|---|
| Function Switch | Q-Multiplier (Q MULT.) |
| ANTENNA Trimmer | Peak for maximum output on "S" meter. |
| MAIN TUNING Control | Peak for maximum output on "S" meter. |
| SENSITIVITY Control | Adjust for desired output level. |
| MAN.-AVC Switch | Manual (MAN.) |
| Band Selector (TUNING RANGE MCS) Switch | Set to desired frequency range. |
| Noise Limiter Switch | OFF or ON as required by local noise conditions. |
| AUDIO GAIN Control | 2/3 to 3/4 clockwise rotation. |
| SELECTIVITY Control | BFO position |
| Frequency (FREQ.) Control | Tune signal to zerobeat with pointer on triangle and then offset either left or right for desired pitch. |

## FUNCTION SWITCH

With the function switch in the Q MULT. position, three modes of operation are possible. CW or Single Side Band signals may be received with the SELECTIVITY control in the BFO position. With the SELECTIVITY control switched off the BFO position, AM signals, under conditions where additional selectivity is required, are received.

The broadest position of the SELECTIVITY control (corresponding to a 6 db bandpass of 3 KCS) is extreme counterclockwise. Rotating the control clockwise will continuously narrow the pass band until the Q-Multiplier goes into oscillation. In the oscillating condition, "single signal" reception of CW is possible.

## SINGLE SIDE BAND OPERATION

The setting of the controls for Single Side Band reception is the same as for CW reception, with the BFO being used for carrier reinsertion. The frequency control should be set approximately 2-1/2 divisions to the left or right of the triangle indice, depending upon whether the upper or lower sideband intelligence is desired. Final tuning should be accomplished with the BAND SPREAD control in order that proper speech registry be achieved.

## BAND SPREAD OPERATION

The BAND SPREAD control may be used for fine tuning by setting it at approximately 90 on the band spread

dial and tuning in the signal with the MAIN TUNING control. Final peaking of the signal is then accomplished by adjustment of the BAND SPREAD control. It should be understood that the setting of the BAND SPREAD control will affect the Main Dial calibration in that a higher frequency setting of the main tuning dial will be required. Rotating the band spread dial from 100 toward 0 tunes the receiver to a lower frequency.

For Band Spread operation in the amateur bands, the following procedure must be followed: The main tuning dial is set to the line marking the high frequency (right-hand end) of a given amateur band. The Band Spread tuning and calibration may then be accomplished solely with the BAND SPREAD control and dial.

## 20BS SWITCH POSITION

A separate switch position is provided on the TUNING RANGE control for spreading the 20-meter band. This switches in another band spread capacitor for optimum spreading of this band.

## TELECHRON AUTOMATIC TIMER

If your receiver is equipped with the built-in Telechron Automatic Clock-Timer, the following instructions should be noted:

Every radio-frequency device is stable only at predetermined operating temperatures. In order to eliminate waiting for receiver to warm-up to operating temperature, the Telechron Timer automatically turns on the receiver ahead of anticipated operating time. This is accomplished by setting the hand of the timer (small knob at rear of receiver) to approximately one-half hour before operating hour. The front panel control under Timer is then set to "Auto" position. The function switch is set to REC. The receiver is then automatically turned on at the desired time.

The clock hands are set by the rear knob. Push in on the knob to set the switch timing hand and pull out on the knob to set the clock hands. The front switch is set to AUTO and the operation switch is set to REC. when it is desired to use the automatic clock switch for pre-warming the receiver before operation or for use as an alarm to turn the receiver on to a pre-tuned station. To use the operation switch normally, the clock switch should be left in the ON position.

The clock will continue to run as long as the receiver line cord is connected to the power outlet, and is extremely useful for checking sign-in periods and schedules.

If your receiver is not equipped with the Telechron Automatic Clock-Timer, and you would care to have the accessory added, clock kits, with full installation instructions, may be had by writing the Hammarlund Mf. Co., 460 West 34th St., New York 1, N. Y. Order CLOCK KIT 38920-G1, or by contacting the nearest Hammarlund dealer.

## POSSIBLE RECEIVER DIFFICULTIES

1. If, upon turning the function switch from "off" to "receive" position, the dials are not illuminated and the receiver fails to operate after two minutes, this indicates that the clock timer switch just above the function switch is not in the proper position. This switch should always be in the ON position unless auto timer is employed.

2. Excessive hum or failure of the Q multiplier to operate properly will usually be due to a defective 12AX7 type tube. Such a defective tube may test good in a tube tester but be unsatisfactory because of higher than normal heater-to-cathode leakage. Poor noise limiter action is usually due to a poor or defective 6AL5 type tube. The use of the noise limiter will result in some distortion which must be tolerated for most efficient noise limiting. Because of this,, when listening to broadcast stations or other strong local signals, the noise limiter switch should be in the "off" position unless the slight distortion is preferable to excessive pulse type noise, such as ignition interference.

3. Erratic S meter performance, lack of sufficient variation, etc., is usually due to the two 6BA6 tubes employed in the S meter circuit. These are the two 6BA6 tubes, V5 and V6, in the schematic diagram. Merely interchanging these tubes will sometimes provide sufficient improvement. Replacing one or both may be found advisable before suspecting other troubles.

4. Excessive drift, after allowing sufficient time for warm up, may be due to a poor type 6C4 tube, V3, in the diagram or 6BE6, V2, in the schematic diagram.

Ninety-nine percent of all receiver trouble has been found to be due to one or more defective tubes. This can undoubtedly be attributed to the rough handling equipments receive in shipment. Please, therefore, be sure to follow the above suggestions in addition to having all tubes tested before writing the Home Office.

# CIRCUIT THEORY

The HQ-100 is basically a single conversion, four-band, superheterodyne receiver with a noise limiter. Its circuitry incorporates a Q-Multiplier for full control of selectivity and also serves as a BFO.

## PRESELECTION

The antenna input coupling and RF amplifier stage provide the necessary preselection and gain for high performance and rejection of undesired signals. The high signal level at the mixer grid, V2, contributes to a favorable signal-to-noise ratio.

Both grid and plate circuits of the RF stage are tuned; individual tuning coils are selected for each band.

The antenna compensating compacitor, adjustable from the front panel, permits the receiver to be resonated for optimum performance with the particular antenna in use.

## CONVERTER STAGE

A high degree of oscillator stability is attained by the use of a separate mixer (6BE6), V2, and an independent oscillator (6C4), V3.

The output signal from RF amplifier V1 is heterodyned with the output of the local high frequency oscillator, V3, and electronically combined within the mixer tube, V2, On the four frequency ranges the local oscillator is 455 KCS above the signal frequency.

Low-loss tube sockets, low-loss, phenolic temperature compensating capacitors, and stable, coaxial trimmers all contribute to oscillator stability. Additional frequency stability is attained by applying regulated voltage to the oscillator circuit and by the rugged construction of the entire HF oscillator section assembly.

## Q MULTIPLIER

The Q-Multiplier circuit employed in this receiver serves a dual function. The Q-Multiplier frequency control provides a means of peaking any signal within the pass band of the IF amplifier. The degree of peaking is controlled by the SELECTIVITY control. This same SELECTIVITY control when turned completely clockwise serves as the beat frequency oscillator on-off switch. In some cases when it is desirable to have narrow band width and the beat frequency oscillator as well, it will be found that the Q-Multiplier will go into oscillation at a point below the full on position. A little experience will be necessary using the Q-Multiplier in this fashion to provide optimum performance in the crowded CW bands, or in using the receiver for single side band reception. The Q-Multiplier is generally never employed on the standard broadcast band or when short wave broadcast stations are being received. The use of the Q-Multiplier under these circumstances will only result in limiting the frequency response of the broadcast band and short wave broadcast stations in view of the very narrow band width that is provided by the Q-Multiplier. Of course, the SELECTIVITY control will make it possible to control this response characteristic. If, by chance, when receiving foreign short wave broadcast stations interference is experienced caused by two stations operating very close to one another, the Q-Multiplier may be employed under these circumstances to minimize, if not eliminate, the interference by the improved selectivity or decreased band width proper adjustment will provide. The proper use of the Q-Multiplier can actually enhance many times the results obtained with this receiver. In view of this, it is suggested that a little time be spent in learning just how to properly adjust the Q-Multiplier frequency and selectivity controls under different receiving conditions. As the Q-Multiplier SELECTIVITY control is advanced, a decided decrease in noise will be apparent. This is due to the narrowing of the pass band. On AM phone signals this control will usually be between the 7 and 11 o'clock positions. The FREQUENCY control should then be adjusted for clarity of signal or for minimum adjacent channel interference. The SELECTIVITY control may be advanced progressively more for SSB and CW reception. The more this control is advanced, the more critical the setting of the FREQUENCY control becomes. Advancing the SELECTIVITY control too far will cause the Q-Multiplier to oscillate. This should be avoided except for CW reception as mentioned above. The Q-Multiplier is a very handy tool in the hands of an experienced operator and, unfortunately, it is beyond the scope of this instruction manual to attempt to be more definite than we have.

## IF AMPLIFIER

Seven, stable tuned circuits, in two stages of IF amplification (V5 and V6), contribute to sensitivity and selectivity. Iron core permeability-tuned transformers improve performance and add to the ease of adjustment. The intermediate frequency is 455 KCS, the RETMA standard.

## AVC SYSTEM

Automatic Volume Control minimizes fading and signal strength variations by controlling the gain of the RF stage V1 and the IF stage V5. As a result, a comfortable and constant level of audio is maintained.

## "S" METER (CARRIER LEVEL)

The "S", or Tuning, Meter is provided to assist in tuning and to give an indication of relative signal strength. Because the meter readings are proportional to AVC voltage, it is operative only in the AVC position.

The meter, which is calibrated to 40 db over S-9, is factory adjusted so that a signal input of approximately 50 microvolts gives a reading of S-9. Each "S" unit indicates a 6 db increase, equivalent to doubling signal strength. Should meter readjustment be necessary:

1. Set function switch to REC.
2. Set front panel SENSITIVITY control to "10" and Q-Multiplier SELECTIVITY control to BFO.
3. With reciever off, mechanically zero pointer with a fine screwdriver.
4. With AVC on and the ANT. terminals shorted, zero pointer with ZERO ADJ potentiometer R-15.

## DETECTOR AND NOISE LIMITER

One section of the 6AL5 tube, V7, is used for the second detector and AVC system. This system produced a minimum of distortion.

The other half of V7 operates as a series, self-adjusting noise limiter. It will reduce automobile ignition and other types of impulse noise to a minimum. Intelligibility is not affected by the noise limiter, although it may be switched off if desired.

## BEAT FREQUENCY OSCILLATOR (BFO)

As mentioned previously, the Q-Multiplier serves a dual function, since it is also employed as the beat frequency oscillator. Under these conditions, with the SELECTIVITY switch in the full counterclockwise position, the Q-Multiplier is made to oscillate more vigorously. The FREQ. control is used under these conditions to vary the pitch. Each calibration division of this control represents approximately 1000 cycles. When receiving single side band transmission, the generally accepted procedure of setting the beat frequency oscillator approximately 1000 cycles above or below zero beat should be employed. In other words, if the beat frequency oscillator FREQ. control is set one degree clockwise or counterclockwise from the center position, optimum single side band reception will usually be obtained. Whether the beat frequency oscillator control will be set clockwise

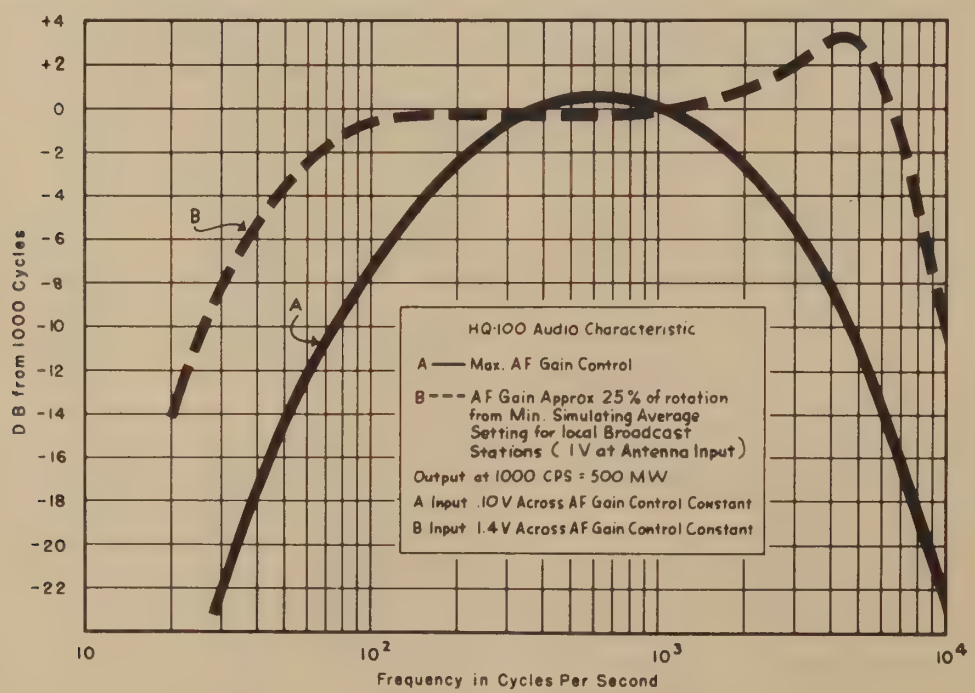



*Figure 6. Auto-Response Curve*

from zero beat will depend on whether upper or lower side band is being transmitted. If the beat frequency oscillator is on the wrong side of zero beat, it will be impossible to obtain intelligibility of the single side band signal when the band spread dial is tuned very slowly through the single side band signal. Should such a condition arise, merely rotate the FREQ. control from the one degree counterclockwise to the one degree clockwise position and then very carefully adjust the BAND SPREAD for intelligible speech. Here again experience is the best teacher. The stability of both the high frequency oscillator and the beat frequency oscillator employed in this receiver plus the excellent mechanical rigidity will provide excellent single side band reception. Refer to the above paragraph on the Q-Multiplier for improved single side band reception. For improved selectivity with BFO, the following procedure may prove advantageous. After a CW signal or single side band signal has been tuned in using the procedure previously given, if the SELECTIVITY control is very gradually rotated in the counterclockwise position, it will be found that the Q-Multiplier will continue to oscillate. Under these conditions, narrower band width with BFO injection will result.

## AUDIO AMPLIFIER

The first audio stage is a resistance coupled voltage amplifier employing the other section of the 12AX7 (V4B). The audio output stage is a 6AQ5 beam power amplifier (V8) providing an undistorted output level of at least one watt.

A feature of the audio system is the variable negative feedback employed (see Auto-Response Curve, Figure 6). Maximum feedback is provided at low settings of the AUDIO GAIN control for the fine quality reception of local broadcast and strong short wave stations. As the AUDIO GAIN control is increased, the feedback decreases so that on reception of weak signals additional selectivity is provided by the audio section. This results in an increased signal-to-noise ratio. A further advantage is the critical damping of the speaker for elimination of speaker "hangover". This upgrades the reception of speech and music and decreases the noise output of the receiver. A further advantage is the reduction of distortion at lower settings of the AUDIO GAIN control.

# ACCESSORIES

Now you can get even more out of your HQ-100 receiver! With a few minutes and an investment of only $15.95 you can get such sparkling reception of single-signal CW you won't believe your ears--that is, till you try the new BFO kit now available from your Hammarlund distributor or directly from Hammarlund Manufacturing Co., Inc. Moss Hill, North Carolina.


The new XC-455 conversion kit is a 455 KCS crystal-controlled BFO designed to be added to the second detector of the HQ-100. With the kit added, the function of selectivity control of the built-in Q-multiplier is greatly enhanced. It permits single-signal CW reception with bandwidth adjustable from approximately 3 KCS to 100 cps.

The XC-455 conversion kit is mechanically identical to the XC-100 crystal calibrator kit and differs only to the extent of the frequency of the oscillator quartz crystal provided. The installation of both units is identical with the sole exception of the termination of the output lead as described in the installation bulletin. Only one of these units may be installed on the receiver chassis. If both are desired one must be used externally.

The kit is quickly and easily installed. It is complete with easy-to-follow instructions, operating switch and mounting hardware -- and it costs only $15.95.

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The XC-100 Crystal Calibrators is available, providing checkpoints every 100 KCS within the range of the receiver.

This is not usually required by the average short wave listener, although it will prove an aid as a means of correcting for possible dial error.

The amateur operator will find this of most value since the 100 KCS checkpoints this unit provides, will make it possible to accurately set amateur band edges. This will result in improving the accuracy of the amateur band spread dial, by determining the exact setting of the main tuning dial.

PL-38657-G5 -- $17.95

# SERVICE AND REALIGNMENT PROCEDURE

NOTE

To service this receiver, disconnect from power source and remove all leadwires attached to terminal connections at rear of chassis apron. Carefully turn the receiver up onto the front panel face on a smooth clean surface. Remove the two #10 hex machine screws at the extreme ends of the chassis apron at the rear of the cabinet, and the knob from the clock adjustment shaft if receiver is so equipped. Lift cabinet straight up and off of chassis. To reassemble, use reverse procedure.

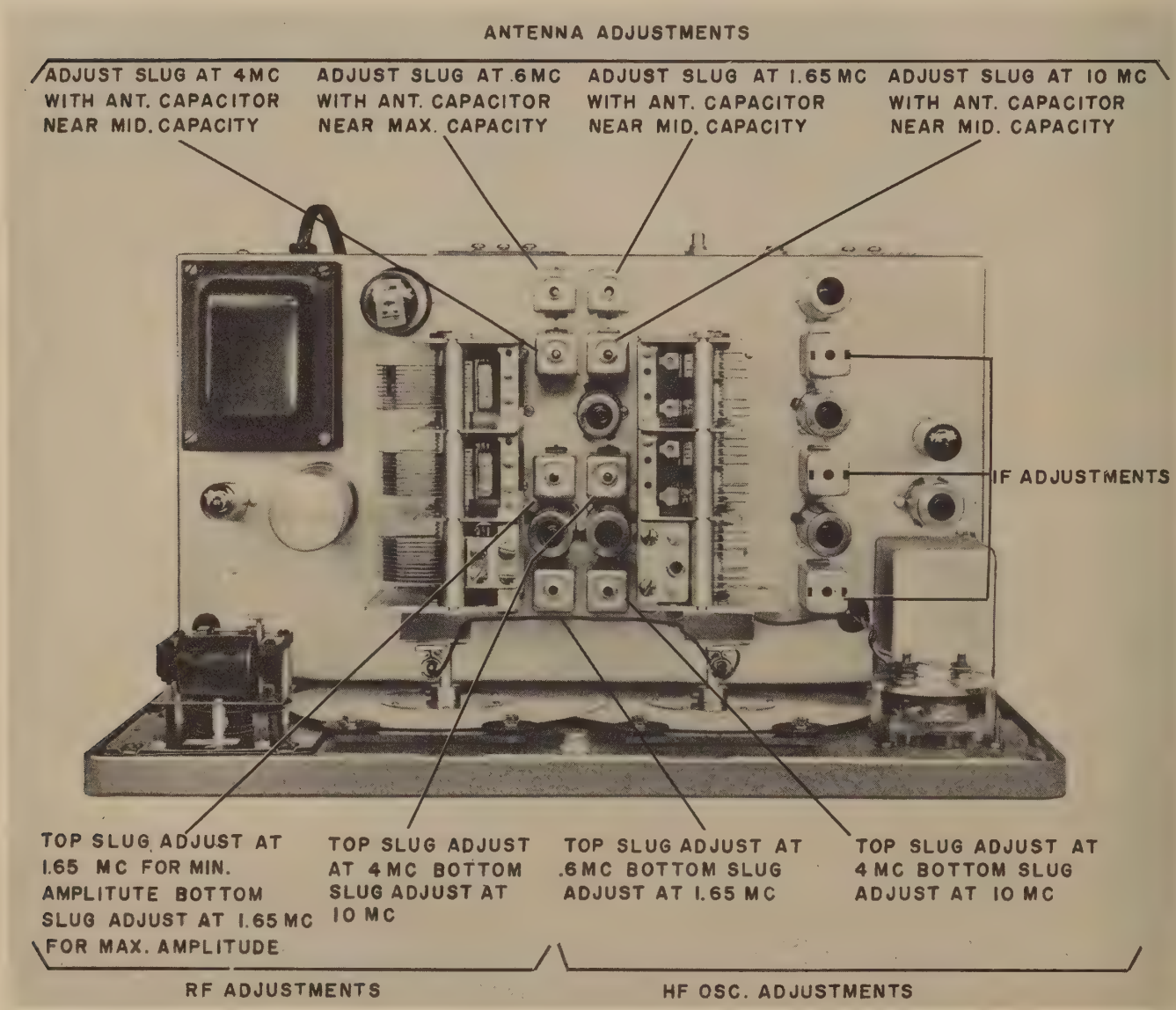



*Figure 7. Top View of Chassis*

## IF ALIGNMENT

NOTE

Use a non-metallic alignment tool such as General Cement Co. No. 5097, or equal.

a. Connect the output cable of a 455 KCS unmodulated, signal generator to the bus lead of the 6BE6 mixer grid. The frequency accuracy of the generator may be checked with sufficient precision by picking up its second harmonic (910 KCS) in any receiver whose calibration at 910 KCS has been checked as correct and then adjusting the generator frequency.

b. Connect a DC vacuum tube voltmeter, set for negative voltage reading to pin 1 of the V7, 6AL5 socket.

c. Set the receiver controls as follows:

BAND SPREAD dial on 100
Function switch on REC.
Main tuning dial on .54 MC
Noise limiter switch on OFF
AUDIO GAIN control at minimum
SELECTIVITY control on BFO
Band selector switch on .54 - 1.6 MC
MAN. -AVC switch on MAN.
SENSITIVITY control on 3 from maximum.

d. During alignment, adjust the generator output and the SENSITIVITY control to prevent overloading. Final adjustment should be made with the SENSITIVITY control at approximately the third indice from its maximum (clockwise) position. Adjust each of the three IF transformers for maximum meter reading. Topside adjustments (Figure 7) are secondaries or grid cir-

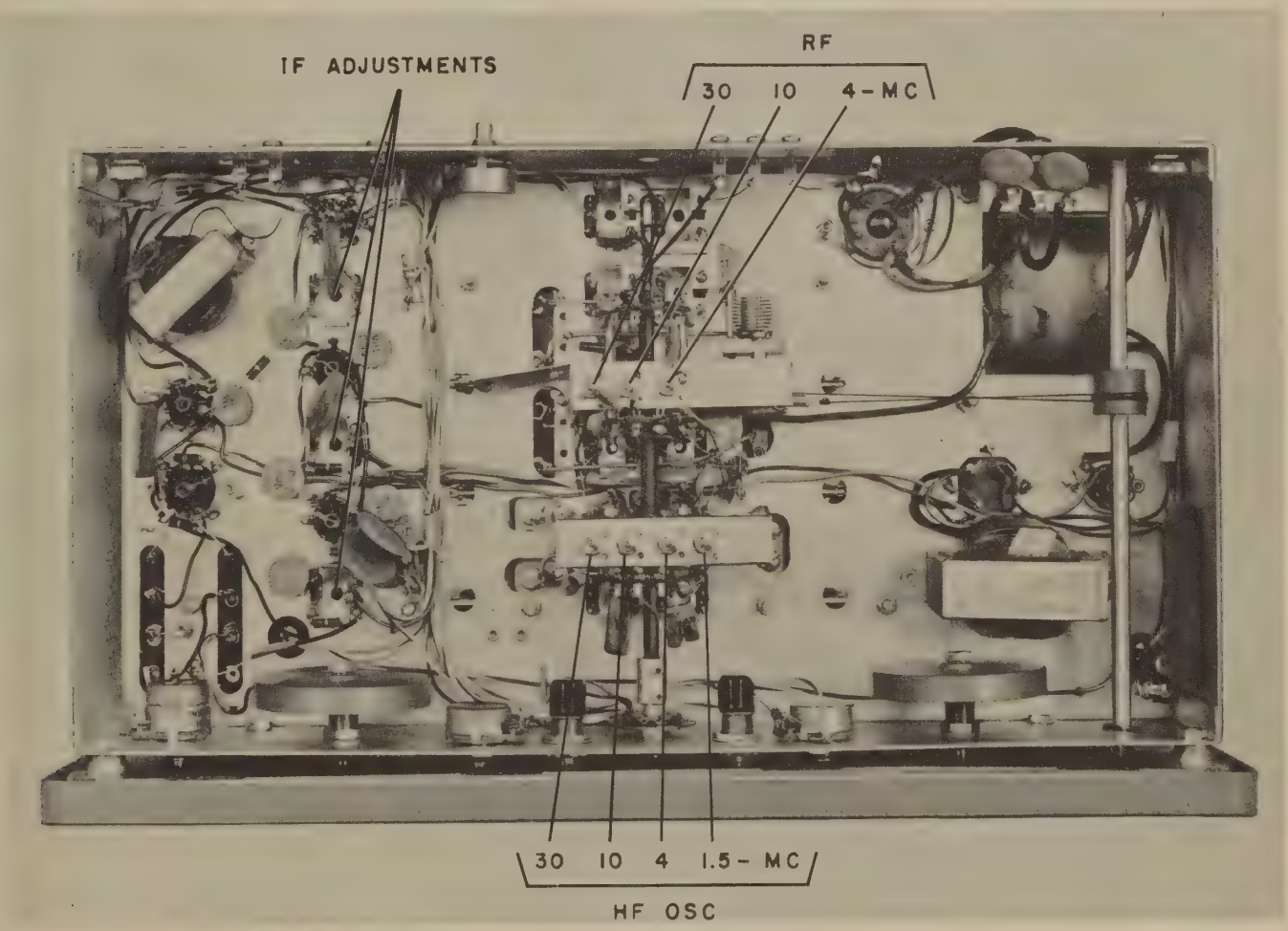



*Figure 8. Bottom View of Chassis*

cuits; bottom of chassis adjustments (Figure 8) are primaries or plate circuits.

e. Turn the function switch to Q MULT. and adjust the SELECTIVITY control counterclockwise to a position below the oscillating point. With its panel bushing nut loosened to permit the frequency shaft to turn without hindrance by the stop, adjust the FREQ. control to obtain a maximum meter indication. The input signal must be adjusted to a value just sufficient to obtain a good meter swing. This adjustment is the center frequency of the pass band and is also the zero setting for the BFO. While the meter is at maximum, turn the stop lug to a position 180 degrees directly opposite the stop pin in the frequency shaft. Holding it in this position, tighten the bushing in the nut making sure that the shaft or the stop lug have not turned by checking the zero setting.

f. With the MAN. -AVC switch on AVC, the SENSITIVITY control at maximum, with grid pin 1 of the V5 amplifier tube grounded, and with no signal input, adjust the METER ZERO ADJUST. pot at the rear of the chassis (Figure 4) for a reading of zero on the "S" meter.

## RF ALIGNMENT

NOTE

Use a non-metallic alignment tool such as General Cement Co. No. 8282, or equal.

a. The slugs and trimmers, having been factory adjusted, should require a minimum amount of adjustment for any realignment.

b. All RF and oscillator slug adjustments are made from the top of the shield cans. See Figure 7.

c. Connect the unmodulated, signal generator output cable to the antenna and ground terminals of the receiver, with the A terminal adjacent to the G terminal jumped together. See Figure 4.

d. Set the controls the same as for IF alignment above. Adjust the SENSITIVITY control as required to obtain a sufficient voltmeter reading and to prevent overloading.

e. The oscillator adjustment is made first. The RF is adjusted next to obtain maximum amplitude. The antenna slugs are adjusted last. A certain amount of interaction will occur between the oscillator and RF adjustments, particularly on the higher frequency bands. Final adjustment should be accomplished by combined or alternate adjustment of the oscillator and RF for maximum amplitude.

NOTE

The trimmer adjustments, if required, should be the final adjustment for each band. See Figure 8 for location of trimmers.

There is no RF amplifier adjustment for the .54 - 1.6 MC band.

f. Note that the oscillator frequency in the HQ-100 is always on the high side of the signal frequency by 455 MCS. Therefore, it is necessary to make sure that the oscillator frequency is not adjusted below the signal frequency which would be an image response of the signal.

g. It will be necessary to repeat low and high end alignment adjustments of each band since the adjustments are interdependent. The process should be repeated until maximum amplitude is obtained at both alignment frequencies of each band.

NOTE

The receiver should be warmed up at least one-half hour before final oscillator frequency adjustments are made for the dial calibration check.

## DIAL CALIBRATION

a. Use a crystal calibrator having 100 KCS and 1000 KCS output. Set the arbitrary band spread dial scale to 100. Set the function switch to Q MULT. Set the FREQ. control to zero (triangular indice). Set the SELECTIVITY control to BFO. Set the MAN. -AVC switch to AVC.

b. Check to see that the frequencies at or near the alignment frequencies are "on the line." If not, make minor adjustments of the slugs and trimmers (Figures 7 and 8) to make them correct.

CAUTION

Weaker signals will be observed at dial settings approximately 10 KCS above each calibration dial marking. These are image signals from 1 MC above the desired signal and may be recognized by their somewhat weaker strength and may be further reduced by proper adjustment of the gain controls. They will, of course, be more noticeable on the higher bands. Keeping the antenna tuned will help.

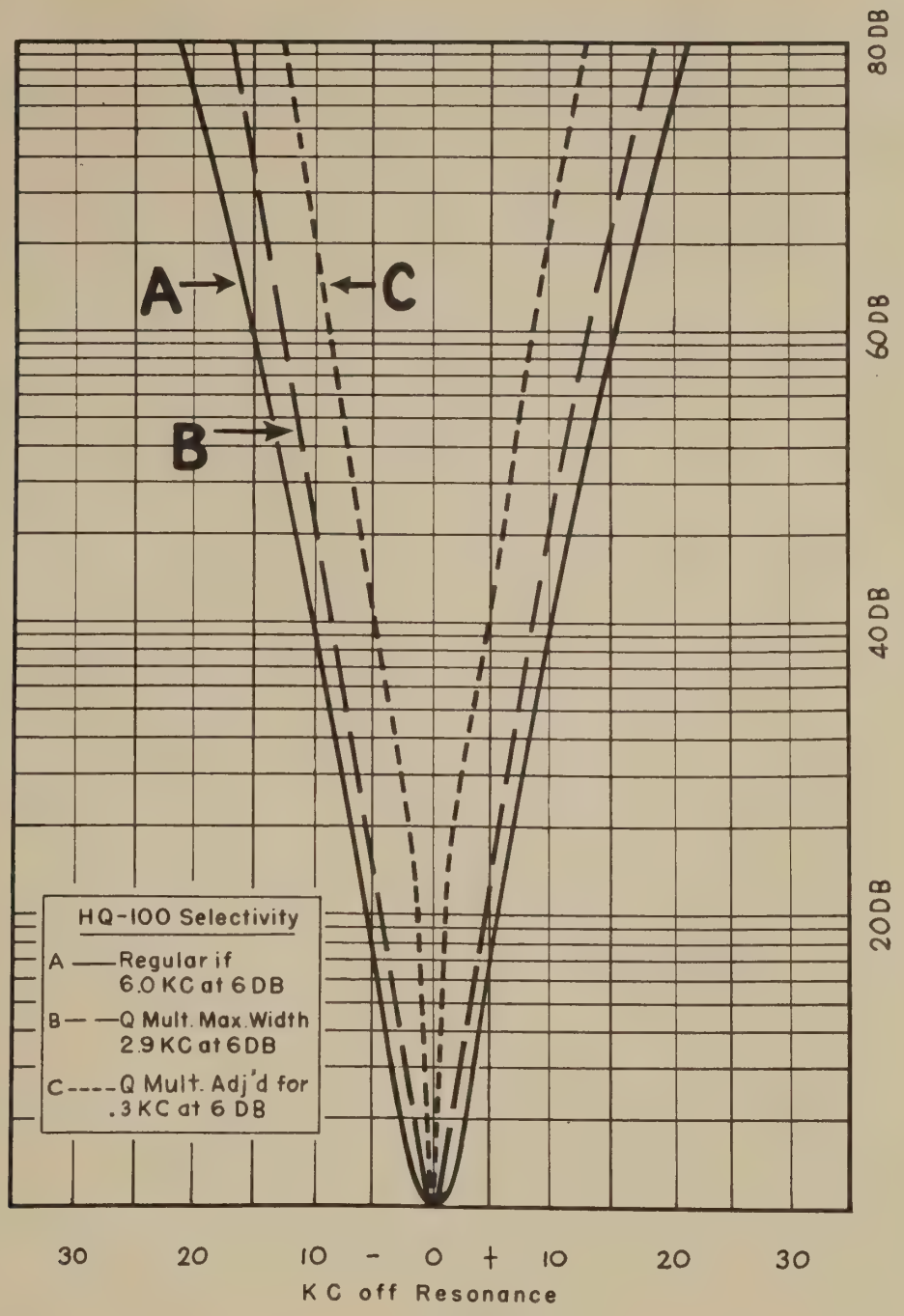



*Figure 9. Selectivity Curves*

## TABLE 1. TUBE SOCKET VOLTAGES

Measured from tube socket pins to chassis with vacuum tube voltmeter. AUDIO GAIN control minimum. Band Selector switch on 10-30 MCS. Noise Limiter switch OFF. MAN. -AVC on MAN. SENSITIVITY control maximum except where noted. Function switch on Q MULT. except where noted. SELECTIVITY control counterclockwise. Line voltage 117. No signal input.

| TUBE | SOCKET PIN NUMBERS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| V1 RF 6BZ6 | - | 1.8 | | 6.3 ac | 245 | 105 | - | - | - |
| V2 MIXER 6BE6 | -1.3 | 1.3 | - | 6.3 ac | 235 | 70 | - | - | - |
| V3 HF OSC 6C4 | 100 | - | - | 6.3 ac | 100 | .7 | - | - | - |
| V4 12AX7 Q MULT. 1st AF | 230 0 ON REC. | - | 2.7 0 ON REC. | 6.3 ac | 6.3 ac | 76 | - | .8 | - |
| V5 1st IF 6BA6 | - | - | - | 6.3 ac | 230 | 105 | 2.15 13.6 Min SENS | - | - |
| V6 2nd IF 6BA6 | - | - | - | 6.3 ac | 230 | 95 | 2.4 13.6 Min SENS | - | - |
| V7 6AL5 DET. LIM. AVC | -.2 | -.3 | - | 6.3 ac | - | - | -.2 | - | - |
| V8 6AQ5 AUDIO OUTPUT | - | 15 | - | 6.3 ac | 260 | 240 | - | - | - |
| V9 0B2 VOLTAGE REG. | 105 | - | - | - | 105 | - | - | - | - |
| V10 5Y3 RECTIFIER | - | 270 | - | 250 ac | - | 250 ac | - | 270 | - |

## TABLE 2. TUBE SOCKET RESISTANCES

Measured from tube socket pins to chassis with vacuum tube ohmmeter. AUDIO GAIN control maximum. SELECTIVITY control on BFO. Noise Limiter switch ON. SENSITIVITY control maximum except where noted. MAN.-AVC on MAN. Function switch on Q MULT. Band Selector switch on 10-30 MCS.

| TUBE | SOCKET PIN NUMBERS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| V1 RF 6BZ6 | 10K 2.4 Meg on AVC | 180 | 0 | 0 | .5 Meg or more | .5 Meg or more | 0 | - | 0 |
| V2 MIXER 6BE6 | 22K | 180 | 0 | 0 | .5 Meg or more | .5 Meg or more | 0 | - | - |
| V3 HF OSC 6C4 | .5 Meg or more | INF | 0 | 0 | .5 Meg or more | 47K | 0 | - | - |
| V4 12AX7 Q MULT. 1st AF | .5 Meg or more | 2.2 Meg | 6800 18K Min Sel. | 0 | 0 | .5 Meg or more | 1 Meg | 2200 | 0 |
| V5 1st IF 6BA6 | 0 2.4 Meg on AVC | 0 | 0 | 0 | .5 Meg or more | .5 Meg or more | 180 10.2K Min Sel. | - | - |
| V6 2nd IF 6BA6 | 470K | 0 | 0 | 0 | .5 Meg or more | .5 Meg or more | 200 10.2K Min Sel. | - | - |
| V7 6AL5 DET. LIM. AVC | 2.1 Meg | 190K | 0 | 0 | .5 Meg or more | .5 Meg or more | 120K | - | - |
| V8 6AQ5 AUDIO OUTPUT | .5 Meg | 430 | 0 | 0 | .5 Meg or more | .5 Meg or more | .5 Meg or more | - | - |
| V9 0B2 VOLTAGE REG. | .5 Meg or more | 0 | INF | 0 | .5 Meg or more | INF | 0 | - | - |
| V10 5Y3 RECTIFIER | - | .5 Meg or more | - | 85 | - | 90 | - | .5 Meg or more | - |

# PARTS LIST

| Schematic Designation | Description | Hammarlund Part No. |
|---|---|---|
| | RESISTORS | |
| R1 | 22 Ohms, 1/2 W | K19309-9 |
| R2 | Potentiometer, 10,000 Ohms | K26218-2 |
| R3 | 10,000 Ohms, 1/2 W | K19309-73 |
| R4 | 1,000 Ohms, 1/2 W | K19309-49 |
| R5 | 22,000 Ohms, 1/2 W | K19309-81 |
| R6 | 180 Ohms, 1/2 W | K19309-31 |
| R8 | 6,200 Ohms, 1/2 W | K19309-176 |
| R9 | 47,000 Ohms, 1/2 W | K19309-89 |
| R10 | 1,000 Ohms, 1/2 W | K19309-49 |
| R11 | 2.2 Megohms, 1/2 W | K19309-129 |
| R12 | 6,800 Ohms, 1/2 W | K19309-69 |
| R13 | Potentiometer, 10,000 Ohms | K15378-1 |
| R14 | 2,200 Ohms, 1/2 W | K19309-57 |
| R15 | Potentiometer, 200 Ohms | K15368-6 |
| R16 | 2,200 Ohms, 1/2 W | K19309-57 |
| R17 | 1,600 Ohms, 1/2 W 5% | K19309-210 |
| R19 | 180 Ohms, 1/2 W 5% | K19309-260 |
| R20 | 5,000 Ohms, 10 W | K19337-4 |
| R21 | 2,200 Ohms, 1/2 W | K19309-57 |
| R27 | Potentiometer, 1 Meg | K26218-3 |
| R28 | 47 Ohms, 1/2 W | K19309-17 |
| R29 | 2,200 Ohms, 1/2 W | K19309-57 |
| R30 | 100 Ohms, 1/2 W | K19309-25 |
| R31 | 430 Ohms, 1 W | K19310-212 |
| R32 | 22 Ohms, 1/2 W | K19309-9 |
| R33 | 180 Ohms, 1/2 W | K19309-31 |
| R34 | 47,000 Ohms, 1/2 W | K19309-89 |
| R35 | 2,200 Ohms, 1/2 W | K19309-57 |
| R36 | 10 Ohms, 1/2 W | K19309-1 |
| R37 | 470K Ohms 1/2 W | K19309-113 |
| J1 | Phone jack | K35608-1 |
| CMC | Clock, Telechron, Auto-timer | K38874-1 |
| | CAPACITORS | |
| C1, A-C | Variable, Main tuning | P38834-1 |
| C2, A-F | Variable, Band spread | P38335-1 |
| C3 | Variable, Antenna compensator | 34454-G11 |
| C4, 5, 6, 7, 8, 9, 10, 15 | Fixed, Ceramic disc, .01mf 600 W.V.D.C. | M23034-14 |
| C11, 12, 13, 15 | Trimmer 1-8 MMF 500 W.V.D.C. | K23008-1 |
| C16, 17, 18 | Fixed, Silver mica, .001 mf 500 W.V.D.C. | K23006-1 |
| C19 | Fixed, Ceramic disc, .01 mf 600 W.V.D.C. | M23034-14 |
| C20, 21, 22, 23 | Variable, 1-8 mmf 500 W.V.D.C. | K23008-1 |
| C24 | Fixed, Silver mica, 430 mmf 300 W.V.D.C. | K23071-317 |
| C25 | Fixed, Silver mica, 1300 mmf 500 W.V.D.C. | K23072-60 |
| C26 | Fixed, Silver mica, 3000 mmf 500 W.V.D.C. | K23072-7 |
| C27 | Fixed, Silver mica, 1100 mmf 500 W.V.D.C. | K23011-59 |
| C28 | Fixed, Silver mica, 3300 mmf 500 W.V.D.C. | K23011-43 |
| C29 | Fixed, Silver mica, 510 mmf 500 W.V.D.C. | K23003-74 |
| C30, 31, 32 | Fixed, Ceramic disc, .01 mf 600 W.V.D.C. | M23034-14 |
| C33 | Fixed, Ceramic disc, .04 mf 600 W.V.D.C. | M23034-12 |
| C34, 35, 36 | Fixed, Ceramic Disc, .01 mf 600 W.V.D.C. | M23034-14 |
| C38 | Fixed, Three-section electrolytic | K15504-62 |

| Schematic Designation | Description | Hammarlund Part No. |
|---|---|---|
| | CAPACITORS (continued) | |
| C38A | 20 mf 450 W. V. D. C. (Part of K15504-62) | |
| C38B | 20 mf 450 W. V. D. C. (Part of K15504-62) | |
| C38C | 25 mf 50 W. V. D. C. (Part of K15504-62) | |
| C41 | Fixed, Ceramic disc, .01 mf 600 W. V. D. C. | M23034-14 |
| C42 | Fixed, Ceramic disc, .005 mf 1000 W. V. D. C. | M23034-10 |
| C43, 44 | Fixed, Ceramic disc, .01 mf 1400 W. V. D. C. | M23034-26 |
| C45, 46 | Fixed, Ceramic disc, .045 mf 600 W. V. D. C. | M23034-12 |
| C47 | Fixed, Discap, temperature compensating, 12 mmf | K23010-2 |
| C48 | Fixed, Ceramic disc, .01 mf 600 W. V. D. C. | M23034-14 |
| C49, 50 | Fixed, Discap, temperature compensating, 2.7 mmf | K23010-1 |
| C51 | Fixed, Discap, temperature compensating, 6.8 mmf | K23010-3 |
| C52 | Fixed, Ceramic, temperature compensating, non-insulated, 1.5 mmf | K23061-208C |
| C53 | Fixed, Silver Mica - 5 mmf | K-23006-5 |
| | COILS | |
| L1 | R. F. Coil Assembly (Bands 1 and 2) | K38816-1 |
| L2 | R. F. Coil Assembly (Bands 3 and 4) | K38817-1 |
| L3 | H. F. Osc. Coil Assembly (Bands 1 and 2) | K38818-1 |
| L4 | H. F. Osc. Coil Assembly (Bands 3 and 4) | K38819-1 |
| L5 | Coil & Ferrule Assembly | K26215-G2 |
| L6 | Choke, Filter, 13 Henries at 65 ma D. C. | K38827-1 |
| | TRANSFORMERS AND IMPEDANCE ASSEMBLIES | |
| T1 | Antenna Transformer Assembly (Band 1) | K38812-1 |
| T2 | Antenna Transformer Assembly (Band 2) | K38813-1 |
| T3 | Antenna Transformer Assembly (Band 3) | K38814-1 |
| T4 | Antenna Coil Assembly (Band 4) | K38815-1 |
| T5, 6, 7 | Transformer, 1st, 2nd, and 3rd I. F. | K38829-1 |
| T8 | Transformer, Output, Max power 5W, impedance match; 10,000 Ohms plate to 4 Ohms voice coil | K38828-1 |
| T9 | Transformer, Power, Primary 115V-60 cycle, Secondary 250-0-250V - 90 ma. | P38826-1 |
| T9A | Power Transformer 110-220 V Primary | P38826-2 |
| Z1 | RC Printed Network | K38846-1 |
| Z2 | RC Printed Network | K38885-1 |
| | SWITCHES | |
| S1A, S1B | Switch Wafer RF | K38824-1 |
| S1C | Switch Wafer HF OSC | K38824-1 |
| S2 | Power-On-Off, SPST (Part of R13, K15378-1) | |
| S3 | OFF-REC-Q MULT., Single section, four position | K38848-1 |
| S4 | MAN. -AVC, SPST | K38857-1 |
| S5 | LIMITER, SPST | K38857-1 |
| 11, 2 | Lamp, Pilot, No. 47, 6.3V, .15A | K16004-1 |
| M1 | Meter, "S" (Carrier Level) | K26149-4 |

# ADDITIONAL HINTS FOR THE NOVICE AND SHORT WAVE LISTENER

A voltage reading of 45 - 50 volts may be obtained between the chassis and a ground as the result of the two power line by-pass condensers that are connected across the power line with the center tap grounded. Since we are dealing with AC, these capacitors will look like resistors to a volt meter. This will also produce a slight shock if the chassis is not grounded, and one happens to contact a grounded object, and the chassis or any exposed part of the receiver. This also will account for a slight spark, if the receiver is connected to the power line and the ground connection is made. For protection a good ground should always be employed.

In using the receiver for CW, or in other words, with the BFO or the Q multiplier in the oscillating state, it is absolutely necessary to take the receiver out of the AVC position and put it into the Manual position. Failure to do this will result in the receiver blocking and erratic action of the S meter. The S meter is only usable in the AVC position. When using BFO or Q multiplier in oscillating state, the audio control should be used at 2/3 to 3/4 rotation clockwise position and the RF sensitivity control employed as a means of adjusting volume.

When employing the Q multiplier for phone use the function switch will, of course, be in the Q multiplier position and it is advisable to start with the Q multiplier selectivity control in the complete counter clock wise position. If this control is advanced past approximately the 2 o'clock position, the Q multiplier may go into oscillation resulting in the blocking of the receiver. For use on phone the Q multiplier selectivity control, will also usually be employed between maximum counter clock wise position and approximately straight up. Beyond this point or even at approximately the straight up position the receiver is usually so selective that it is capable of wiping the modulation off the carrier by actually rejecting the side bands. For normal phone use or broadcast reception the selectivity control should always be employed in the BFO or clock wise position, since this results in the operation of a switch which disconnects the Q multiplier from the IF system and makes it ready to act as a BFO when the function switch is turned to the Q multiplier position. In other words, if it is desirable to use the BFO to locate a station when tuning for weak signals, after the phone carrier is tuned in, merely rotate the function switch from the Q multiplier position to the Receive position which will result in turning off the BFO for phone reception. If interference is experienced either between stations close to one another, or an interfering CW signal, first turn the Q multiplier selectivity control completely counter clock wise, then the function switch to the Q multiplier position. Gradually advance the Q multiplier selectivity control which will result in increasing the selectivity by producing a spike or narrow band width that is adjustable from approximately 3 kc to 100 cycles in width. This spike can be moved around within the IF pass band that is nominally approximately 6 kc wide. The frequency control is the means for varying the position of this spike. Assuming that the selectivity control is adjusted to produce a spike 1 kc wide and also assuming that the band width of the IF system is 6 kc wide, it can be appreciated that the shape of the IF system response curve can be varied by moving the 1 kc band width anywhere within the 6 kc band width. This will produce a valley on either side of the spike or peak. By proper tuning, therefore, of the band spread dial and the frequency control of the Q multiplier, it should be apparent that an interfering signal may be placed in a valley and the desired signal on the peak, with the net result of decreasing the strength or eliminating the signal that is in the valley, without seriously affecting the desired signal intelligibility.

Since the use of the Q multiplier naturally means narrower band width, it should only be employed when interference is present. Never use the Q multiplier on the broadcast band unless you are hunting weak DX signals and are therefore not after maximum fidelity response. The same, more or less, applies to short wave broadcast listening. Here the use of the Q multiplier in addition to functioning as previously described may also prove advantageous from a noise reduction standpoint as a direct result of the decreased band width.

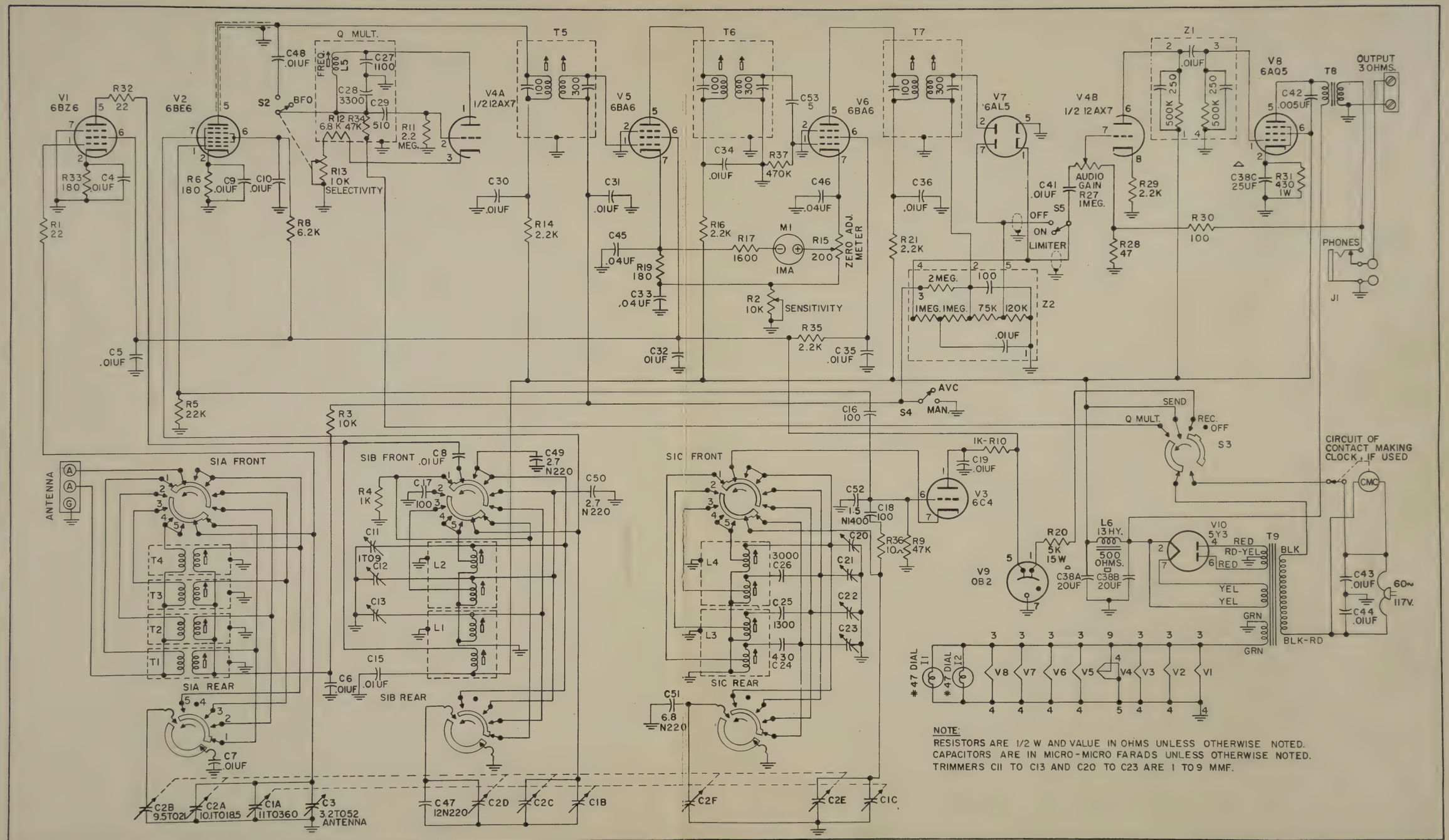
# ADDITIONAL HINTS FOR THE NOVICE AND SHORT WAVE LISTENER

A voltage reading of 45 - 50 volts may be obtained between the chassis and a ground as the result of the two power line by-pass condensers that are connected across the power line with the center tap grounded. Since we are dealing with AC, these capacitors will look like resistors to a volt meter. This will also produce a slight shock if the chassis is not grounded, and one happens to contact a grounded object, and the chassis or any exposed part of the receiver. This also will account for a slight spark, if the receiver is connected to the power line and the ground connection is made. For protection a good ground should always be employed.

In using the receiver for CW, or in other words, with the BFO or the Q multiplier in the oscillating state, it is absolutely necessary to take the receiver out of the AVC position and put it into the Manual position. Failure to do this will result in the receiver blocking and erratic action of the S meter. The S meter is only usable in the AVC position. When using BFO or Q multiplier in oscillating state, the audio control should be used at 2/3 to 3/4 rotation clockwise position and the RF sensitivity control employed as a means of adjusting volume.

When employing the Q multiplier for phone use the function switch will, of course, be in the Q multiplier position and it is advisable to start with the Q multiplier selectivity control in the complete counter clock wise position. If this control is advanced past approximately the 2 o'clock position, the Q multiplier may go into oscillation resulting in the blocking of the receiver. For use on phone the Q multiplier selectivity control, will also usually be employed between maximum counter clock wise position and approximately straight up. Beyond this point or even at approximately the straight up position the receiver is usually so selective that it is capable of wiping the modulation off the carrier by actually rejecting the side bands. For normal phone use or broadcast reception the selectivity control should always be employed in the BFO or clock wise position, since this results in the operation of a switch which disconnects the Q multiplier from the IF system and makes it ready to act as a BFO when the function switch is turned to the Q multiplier position. In other words, if it is desirable to use the BFO to locate a station when tuning for weak signals, after the phone carrier is tuned in, merely rotate the function switch from the Q multiplier position to the Receive position which will result in turning off the BFO for phone reception. If interference is experienced either between stations close to one another, or an interfering CW signal, first turn the Q multiplier selectivity control completely counter clock wise, then the function switch to the Q multiplier position. Gradually advance the Q multiplier selectivity control which will result in increasing the selectivity by producing a spike or narrow band width that is adjustable from approximately 3 kc to 100 cycles in width. This spike can be moved around within the IF pass band that is nominally approximately 6 kc wide. The frequency control is the means for varying the position of this spike. Assuming that the selectivity control is adjusted to produce a spike 1 kc wide and also assuming that the band width of the IF system is 6 kc wide, it can be appreciated that the shape of the IF system response curve can be varied by moving the 1 kc band width anywhere within the 6 kc band width. This will produce a valley on either side of the spike or peak. By proper tuning, therefore, of the band spread dial and the frequency control of the Q multiplier, it should be apparent that an interfering signal may be placed in a valley and the desired signal on the peak, with the net result of decreasing the strength or eliminating the signal that is in the valley, without seriously affecting the desired signal intelligibility.

Since the use of the Q multiplier naturally means narrower band width, it should only be employed when interference is present. Never use the Q multiplier on the broadcast band unless you are hunting weak DX signals and are therefore not after maximum fidelity response. The same, more or less, applies to short wave broadcast listening. Here the use of the Q multiplier in addition to functioning as previously described may also prove advantageous from a noise reduction standpoint as a direct result of the decreased band width.




NOTE:
RESISTORS ARE 1/2 W AND VALUE IN OHMS UNLESS OTHERWISE NOTED.
CAPACITORS ARE IN MICRO-MICRO FARADS UNLESS OTHERWISE NOTED.
TRIMMERS C11 TO C13 AND C20 TO C23 ARE 1 TO 9 MMF.

*Figure 10. Hammarlund HQ-100 Receiver, Schematic Diagram*

ESTABLISHED 1910

*Established* 1910

# HAMMARLUND
# HQ-100
# CLOCK-KIT
## INSTALLATION INSTRUCTIONS

APD. 422

# INSTRUCTIONS FOR INSTALLATION
# ELECTRIC CLOCK TIMER KIT #38896-1
# FOR HAMMARLUND HQ-100 COMMUNICATIONS RECEIVER

The HQ-100 receiver has been designed so that the basic model which does not incorporate the clock-timer can be modified to include modification Kit #38896-1. This work can be done by relatively inexperienced personnel and requires only light repair tools and a small soldering iron. The modification in effect converts the receiver to an HQ-100-C model identical to factory production.

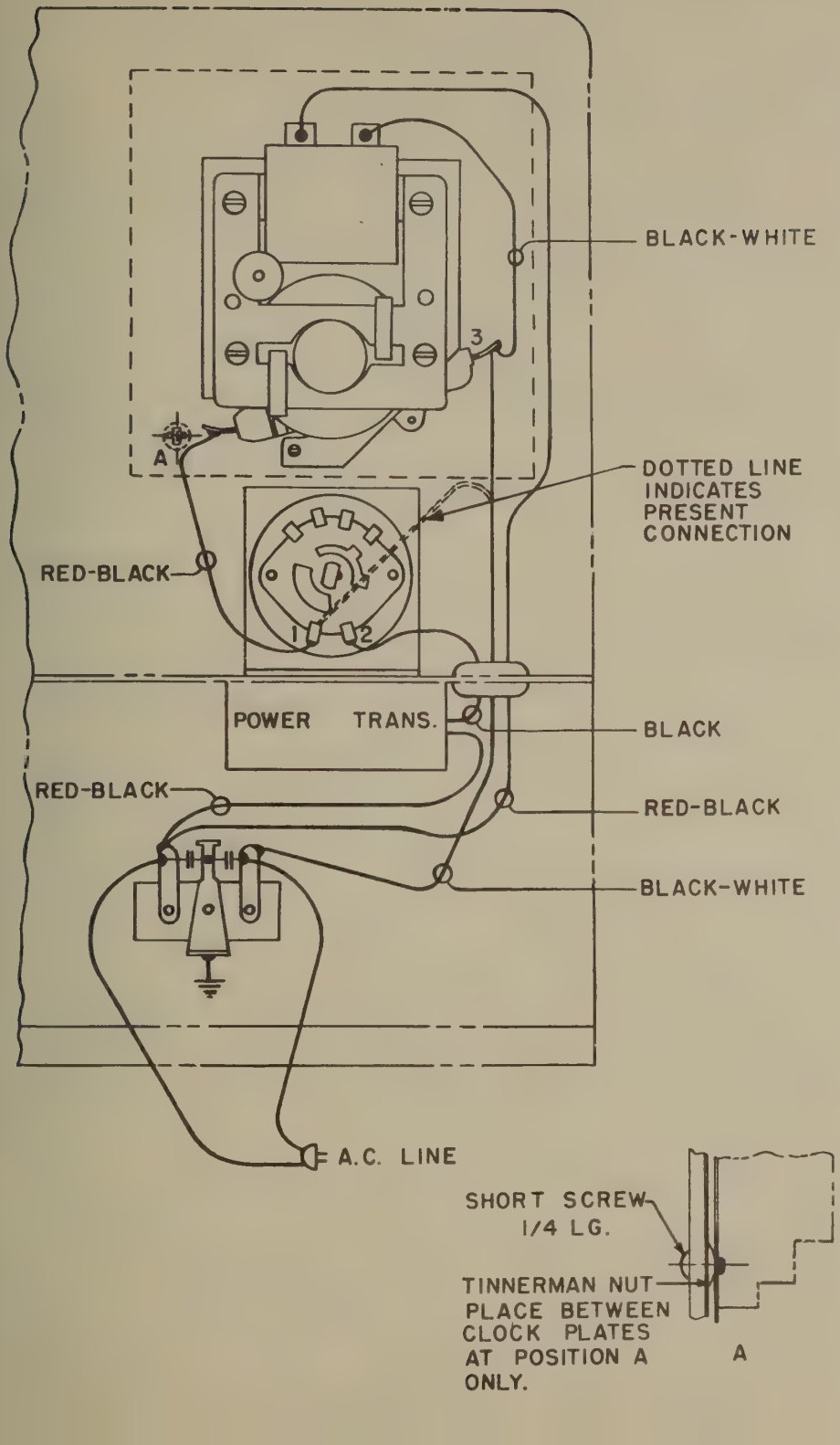
Please read these step-by-step instructions carefully and follow them in detail. In making solder connections, use a light, clean soldering iron and radio-grade rosin core solder only. DO NOT use fluxes of any kind in making solder connections. Do not overheat connections to avoid deteriorating associated insulating materials.

Make certain that the power cord plug is removed from the power outlet. Disconnect all wires from the terminals at the rear of the chassis. Carefully turn the receiver up on its face on top of a clean towel placed over a smooth working surface. This will prevent marring of the front panel, knobs, etc. Employing a proper sized socket wrench, remove the two screws at the cabinet rear corners which fasten the cabinet to the chassis. Lift the cabinet off from the receiver assembly passing the power cord through the opening at the rear of the cabinet. Tip the receiver back on the chassis so that the front panel is vertical.

Using a small Phillips-type screwdriver, remove the four screws and sheet metal fastening nuts which hold the plastic window and medallion plate to the front panel. Please note that there are three long screws and one short screw. The short screw must be used in the lower right corner hole and the sheet metal nut must be placed between the two sheet metal plates of the clock as shown in the accompanying instruction diagram (See Detail A).

First place the plastic clock window in the panel opening, making certain that the deeper dimension of the window is at the bottom of the opening. Hold the upper left side of the main tuning dial with the fingers of the right hand and carefully spring the dial away from the panel sufficiently to permit the front panel control shaft of the clock to be passed through the appropriate panel hole below the window, and the clock front plate assembly to be positioned directly behind the front panel. Engage the short screw through the front panel and into the sheet metal nut in the lower right corner of the clock. Engage the remaining three fastening screws and place the sheet metal nuts behind the rear of the clock plates. Carefully tighten all four screws. This should adequately clamp the plastic clock window and secure the clock mechanism to the front panel. When making soldered connections, be careful to prevent the hot soldering iron from contacting the plastic dial scale. Unsolder the black-white wire from the left bottom terminal of the operations switch (shown dotted in the diagram) and connect and solder this wire together with the black-white wire of the

(Continued on back page)


BLACK-WHITE
3
A
DOTTED LINE
INDICATES
PRESENT
CONNECTION
RED-BLACK
1
2
POWER TRANS.
BLACK
RED-BLACK
RED-BLACK
BLACK-WHITE
A.C. LINE
SHORT SCREW
1/4 LG.
TINNERMAN NUT
PLACE BETWEEN
CLOCK PLATES
AT POSITION A
ONLY.
A

clock assembly to the clock switch terminal space (marked 3 in the diagram). Connect and solder the red-black lead of the clock assembly to the operations switch terminal from which the black-white wire was removed. Pass the long red-black wire of the clock assembly down through the rubber chassis grommet to the underside of the chassis and around the end of the chassis with the other wires adjoining it, cut it and strip it to the proper length. Connect and solder this wire to the terminal of the A.C. power line terminal strip that has the red-black wire from the power transformer connected to it as shown in the diagram. The new red-black wire should be dressed and tied down with the other wires under the chassis to avoid contact with the flat wire-wound resistor unit and to avoid interference with the antenna capacitor drive cable and its stop pin.

Screw the threaded end of the shaft extension provided onto the small threaded end of the rear shaft of the clock. This shaft extension must be securely tightened by clamping the small clock shaft with vise-grip or gas pipe pliers to prevent its turning loose with the shaft extension gripped in another pair of vise-grip or gas pipe pliers. Avoid bending the shaft during this tightening operation.

After completing all of the above operations and making certain that all connections are properly completed and that no foreign matter has been left in the receiver, carefully turn the receiver chassis up on its face per previous instructions. Pass the power cord through the opening at the rear of the cabinet and carefully set the cabinet down in place on top of the chassis, locating the clock shaft extension through the hole in the rear of the cabinet. Engage the front edges of the cabinet in the slot provided at the rear of the front panel and replace the two rear screws which secure the receiver to the cabinet. With a small knob-type screwdriver secure the small knob on the rear adjustment shaft of the clock and press the small set knob on the front clock switch control shaft directly beneath the clock face.

The clock hands are set by the rear knob. Push in on the knob to set the switch timing hand and pull out on the knob to set the clock hands. The front switch is set to AUTO and the operation switch is set to REC. when it is desired to use the automatic clock switch for pre-warming the receiver before operation or for use as an alarm to turn the receiver on to a pre-tuned station. To use the operation switch normally, the clock switch should be left in the ON position. The clock will run continuously so long as the power line cord is connected to a 115 volt, 60 cycle source.

# HQ-100 COMMUNICATIONS RECEIVER

TECHNICAL DESCRIPTION AND OPERATING INSTRUCTIONS

HAMMARLUND

Hammarlund Manufacturing Co.
53 West 23rd Street, New York, N.Y. 10010

International Division: 13 East 40th Street, New York 16, N.Y.

# THE
# HQ-100, HQ-100C, HQ-100E
# COMMUNICATIONS
# RECEIVERS

INSTRUCTION AND SERVICE INFORMATION

ESTABLISHED 1910

In order to receive the full unconditional 90-day warranty against defective material and workmanship in this receiver, the warranty card must be filled out and mailed within two weeks of purchase. Please refer to serial number of warranty in correspondence.

**HAMMARLUND MANUFACTURING CO.**
53 West 23rd Street, New York, N.Y. 10010


*Figure 1. The HQ-100 Receiver*

TUBE COMPLEMENT

| Symbol | Type | Tube | Function |
|---|---|---|---|
| V1 | 6BZ6 | Pentode | RF Amplifier |
| V2 | 6BE6 | Pentagrid Converter | Mixer |
| V3 | 6C4 | Triode | HF Oscillator |
| V4A | 1/2 12AX7 | Triode | First AF Amplifier |
| V4B | 1/2 12AX7 | Triode | Q-Multiplier - BFO |
| V5 | 6BA6 | Remote Cutoff Pentode | First IF Amplifier |
| V6 | 6BA6 | Remote Cutoff Pentode | Second IF Amplifier |
| V7 | 6AL5 | Twin Diode | Detector, Series Noise Limiter |
| V8 | 6AQ5 | Beam Power Amplifier | Audio Power Output |
| V9 | 0B2 | Gas Filled Diode | Voltage Regulator |
| V10 | 5Y3 | Twin Diode | Rectifier |

# INTRODUCTION

The Hammarlund HQ-100 is an all-new communications receiver representing entirely new concepts in electrical and mechanical design. It will provide years of top performance with minimum maintenance. The HQ-100 has a self-contained power supply operating from a 60 cps, 105-125 volt AC source. The Hammarlund HQ-100-C incorporates a telechron automatic electric clock-timer in its design. The export model, HQ-100-E, will operate from a 50-60 cps, 115-230 volt AC source. Because of the power supply operating frequency of the export model, the automatic timer and clock is not incorporated in this model.

The HQ-100 is a superheterodyne receiver with a frequency coverage continuously tunable from 540 KCS to 30 MCS with extremely fine control in separation of crowded signals. A very high signal-to-noise ratio plus the famous Hammarlund noise limiter circuit, permits full use of the receiver's excellent sensitivity on the weakest signals. A Q-Multiplier is provided for varying the selectivity of the receiver.

Electrical band spread tuning is provided with direct calibration every 10 KCS on 80, 40, and 20 meter bands; every 20 KCS on the 15 meter band and every 50 KCS on the 10 meter band. In addition, an arbitrary band spread logging scale is provided for use throughout the tuning range of the receiver.

A new audio output circuit feature is the Auto-Response which automatically narrows and widens the frequency range of the audio output, depending upon the gain required. This feature permits the receiver to be used as a high-fidelity receiver on stronger signals, while providing the sharp cutoff required in receiving communication signals. A second advantage of the Hammarlund Auto-Response is the rapid damping of the audio power in the speaker voice coil which greatly minimizes undesirable speaker "hangover." The receiver may be used with either speaker or headphones. Fast acting AVC maintains a constant audio level. Adequate filtering practically eliminates AC power ripple.

The HQ-100 is equipped with a stable beat frequency oscillator which provides the operator with a continuous range of audio tones when receiving telegraph, code signals, or excellent single-side band reception.

An "S" meter is provided to obtain accurate readings on received phone signals and to assure "on-the-nose" tuning. A send-receive switch is provided to silence the receiver while transmitting.

Large, comfortable controls in logical groupings are provided for greatest operating ease. The new futuristic front panel is clearly marked to permit full attention to the operating at hand.

The HQ-100 was designed with you in mind. You'll have many hours of pleasure and use in operating this truly fine communications instrument.

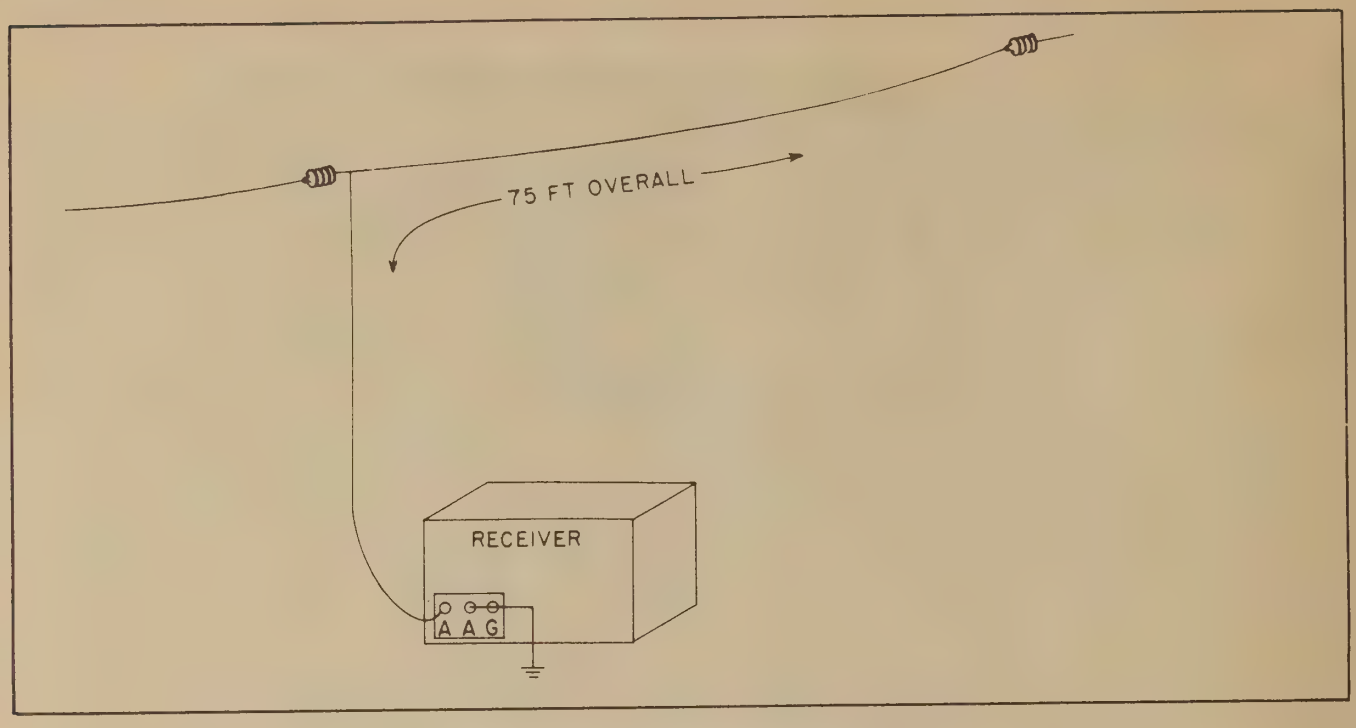



*Figure 2. Installation of Single-wire Antenna*

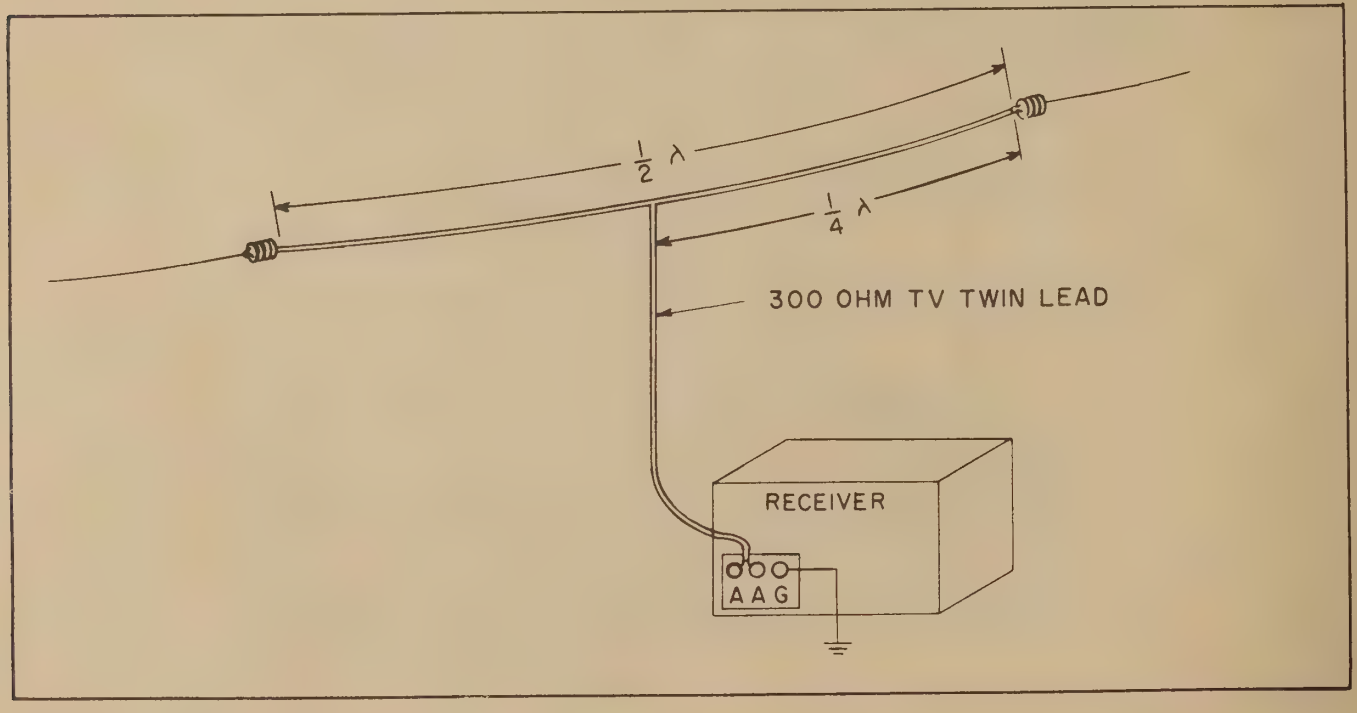



*Figure 3. Installation of Folded Dipole Antenna*

# INSTALLATION

## UNPACKING

Unpack the receiver carefully. Make sure the tubes, associated tube shields and pilot lamps are in place.

## SPEAKER CONNECTION

Connect a 3.2 ohm permanent magnet dynamic speaker (Hammarlund S-100 Speaker) to the two terminals marked SPKR. on the rear of the chassis. (Note Figure 4). For best performance do not place speaker on top of receiver cabinet.

## POWER CONNECTIONS

Before inserting attachment plug into power outlet, make certain power source is of proper voltage and frequency. (Refer to paragraph one of INTRODUCTION.)

## INSTALLING ANTENNA

The HQ-100 is designed to operate with a single wire or a balanced type antenna. The front panel antenna trimmer control (Figure 5) permits a good match to most antennae systems of 50 to 600 ohms.

For general coverage, single wire antennae of 20 to 50 feet length will provide surprisingly good reception. A long single wire outdoor antenna, such as shown in Figure 2, will generally provide entirely satisfactory performance. This wire may be 50 to 150 feet long.

For best reception, the antenna should be isolated as much as possible from neighboring objects and at right angles to power lines or busy highways so as to minimize possible interference pickup.

Optimum performance on a particular amateur band or other narrow tuning range will be obtained by using a tuned half-wave dipole or folded dipole fed with 300 ohm transmission line or other suitable lead-in, as shown in Figure 3.

To tune the one-half wave length dipole, the following formula for the length of the antenna may be used:

$$\text{Length (feet)} = \frac{463}{\text{Freq. (MCS)}}$$

Each half (1/4 wave length) is half the length found from the above formula.

A good ground, although not always necessary, will generally aid in reception and reduce stray line hum. Reversal of polarity of power cord plug may possibly further reduce line hum in some locations.

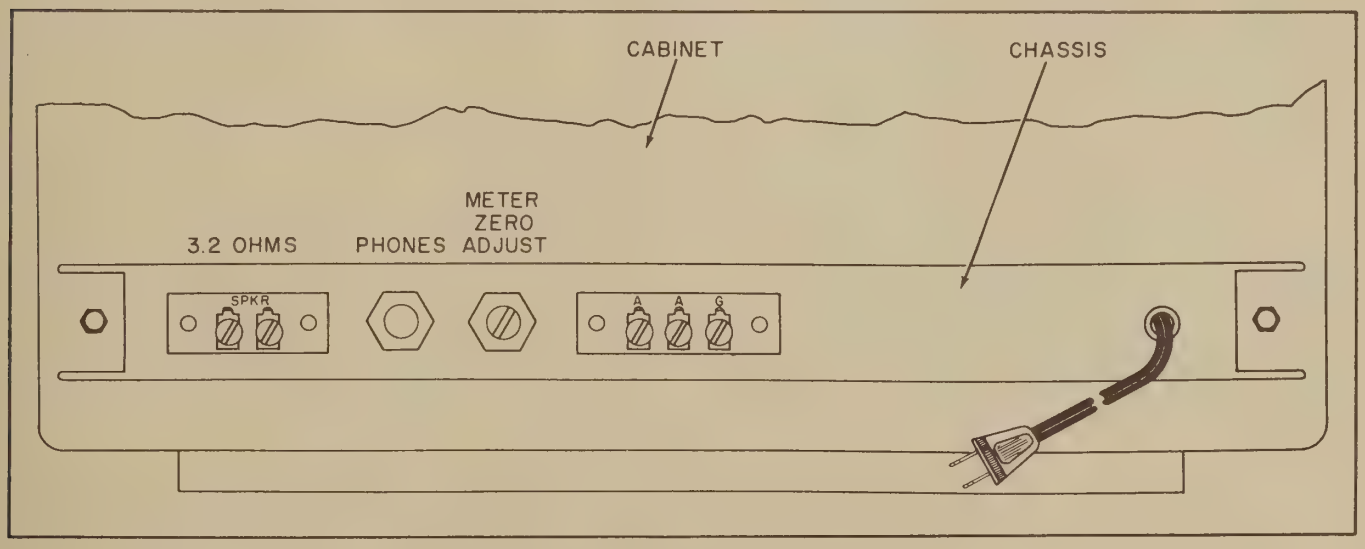
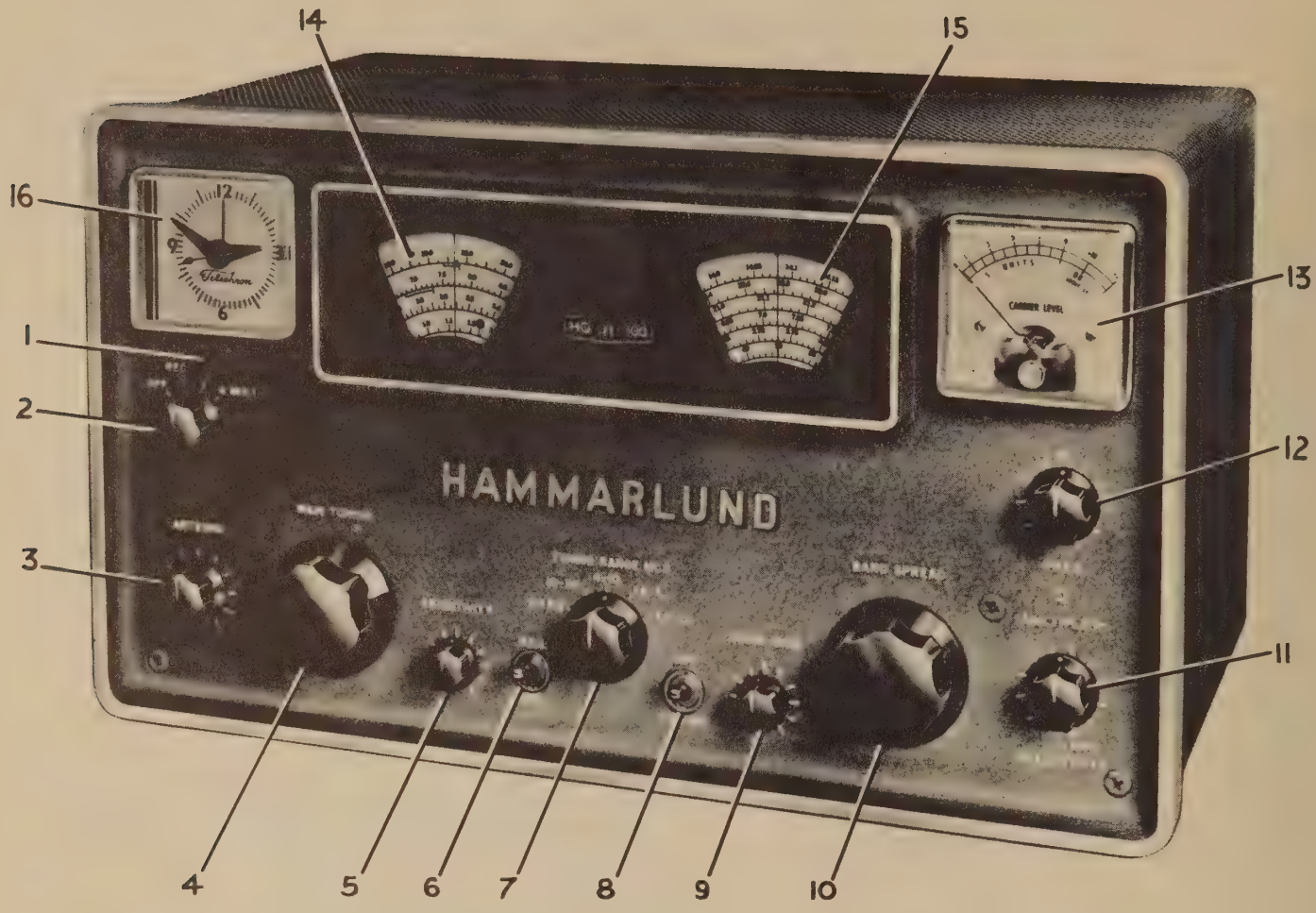



*Figure 4. Connection Points at Rear of Chassis*




| INDEX NO. | CONTROL | INDEX NO. | CONTROL |
|---|---|---|---|
| 1 | Automatic Clock-Timer Control | 9 | AUDIO GAIN Control |
| 2 | Function Switch | 10 | Electrical BAND SPREAD Control |
| 3 | ANTENNA Trimmer | 11 | SELECTIVITY Control |
| 4 | MAIN TUNING Control | 12 | Frequency Control |
| 5 | SENSITIVITY Control | 13 | "S" Meter |
| 6 | MAN. -AVC Switch | 14 | Main Tuning Dial |
| 7 | Band Selector Switch | 15 | Electrical Band Spread Dial |
| 8 | Noise Limiter Switch | 16 | Telechron Automatic Clock-Timer |

*Figure 5. Location of Controls*

# OPERATION

Basically, all that is necessary to operate a radio receiver are the tuning and volume controls. The additional controls found on the front panel of a communications receiver such as the HQ-100, control functions which greatly improve operating performance and make possible reception of otherwise unintelligible signals.

## NORMAL CONTROL SETTINGS

For "normal" operation such as broadcast, short wave listening, etc., the position of the various controls should be as follows:

| | |
|---|---|
| Function Switch | Receive (REC.) |
| ANTENNA Trimmer | Tune for highest "S" meter reading on signal. |
| MAIN TUNING Control | Tune for highest "S" meter reading on signal. |
| SENSITIVITY Control | Fully clockwise |
| MAN.-AVC Switch | AVC |
| Band Selector (TUNING RANGE MCS) Switch | Set to desired frequency range. |
| Noise Limiter Switch | OFF |
| AUDIO GAIN Control | Adjust for proper level. |
| BAND SPREAD Control | Set counterclockwise to "100" on band spread dial. |
| SELECTIVITY Control | BFO position * |
| Frequency (FREQ.) Control | Set pointer to triangular marking. |

* Setting the SELECTIVITY control to BFO with the function switch in receive position disconnects the Q-Multiplier from the IF allowing normally broad IF bandpass.

## CODE SIGNAL RECEPTION

For reception of code signals, the controls should be set as follows:

| | |
|---|---|
| Function Switch | Q-Multiplier (Q MULT.) |
| ANTENNA Trimmer | Peak for maximum output on "S" meter. |
| MAIN TUNING Control | Peak for maximum output on "S" meter. |
| SENSITIVITY Control | Adjust for desired output level. |
| MAN.-AVC Switch | Manual (MAN.) |
| Band Selector (TUNING RANGE MCS) Switch | Set to desired frequency range. |
| Noise Limiter Switch | OFF or ON as required by local noise conditions. |
| AUDIO GAIN Control | 2/3 to 3/4 clockwise rotation. |
| SELECTIVITY Control | BFO position |
| Frequency (FREQ.) Control | Tune signal to zerobeat with pointer on triangle and then offset either left or right for desired pitch. |

## FUNCTION SWITCH

With the function switch in the Q MULT. position, three modes of operation are possible. CW or Single Side Band signals may be received with the SELECTIVITY control in the BFO position. With the SELECTIVITY control switched off the BFO position, AM signals, under conditions where additional selectivity is required, are received.

The broadest position of the SELECTIVITY control (corresponding to a 6 db bandpass of 3 KCS) is extreme counterclockwise. Rotating the control clockwise will continuously narrow the pass band until the Q-Multiplier goes into oscillation. In the oscillating condition, "single signal" reception of CW is possible.

## SINGLE SIDE BAND OPERATION

The setting of the controls for Single Side Band reception is the same as for CW reception, with the BFO being used for carrier reinsertion. The frequency control should be set approximately 2-1/2 divisions to the left or right of the triangle indice, depending upon whether the upper or lower sideband intelligence is desired. Final tuning should be accomplished with the BAND SPREAD control in order that proper speech registry be achieved.

## BAND SPREAD OPERATION

The BAND SPREAD control may be used for fine tuning by setting it at approximately 90 on the band spread

dial and tuning in the signal with the MAIN TUNING control. Final peaking of the signal is then accomplished by adjustment of the BAND SPREAD control. It should be understood that the setting of the BAND SPREAD control will affect the Main Dial calibration in that a higher frequency setting of the main tuning dial will be required. Rotating the band spread dial from 100 toward 0 tunes the receiver to a lower frequency.

For Band Spread operation in the amateur bands, the following procedure must be followed: The main tuning dial is set to the line marking the high frequency (right-hand end) of a given amateur band. The Band Spread tuning and calibration may then be accomplished solely with the BAND SPREAD control and dial.

## 20BS SWITCH POSITION

A separate switch position is provided on the TUNING RANGE control for spreading the 20-meter band. This switches in another band spread capacitor for optimum spreading of this band.

## TELECHRON AUTOMATIC TIMER

If your receiver is equipped with the built-in Telechron Automatic Clock-Timer, the following instructions should be noted:

Every radio-frequency device is stable only at predetermined operating temperatures. In order to eliminate waiting for receiver to warm-up to operating temperature, the Telechron Timer automatically turns on the receiver ahead of anticipated operating time. This is accomplished by setting the hand of the timer (small knob at rear of receiver) to approximately one-half hour before operating hour. The front panel control under Timer is then set to "Auto" position. The function switch is set to REC. The receiver is then automatically turned on at the desired time.

The clock hands are set by the rear knob. Push in on the knob to set the switch timing hand and pull out on the knob to set the clock hands. The front switch is set to AUTO and the operation switch is set to REC. when it is desired to use the automatic clock switch for pre-warming the receiver before operation or for use as an alarm to turn the receiver on to a pre-tuned station. To use the operation switch normally, the clock switch should be left in the ON position.

The clock will continue to run as long as the receiver line cord is connected to the power outlet, and is extremely useful for checking sign-in periods and schedules.

If your receiver is not equipped with the Telechron Automatic Clock-Timer, and you would care to have the accessory added, clock kits, with full installation instructions, may be had by writing the Hammarlund Mf. Co., 53 West 23rd Street, New York, N.Y. 10010 Order CLOCK KIT 38920-G1, or by contacting the nearest Hammarlund dealer.

## POSSIBLE RECEIVER DIFFICULTIES

1. If, upon turning the function switch from "off" to "receive" position, the dials are not illuminated and the receiver fails to operate after two minutes, this indicates that the clock timer switch just above the function switch is not in the proper position. This switch should always be in the ON position unless auto timer is employed.

2. Excessive hum or failure of the Q multiplier to operate properly will usually be due to a defective 12AX7 type tube. Such a defective tube may test good in a tube tester but be unsatisfactory because of higher than normal heater-to-cathode leakage. Poor noise limiter action is usually due to a poor or defective 6AL5 type tube. The use of the noise limiter will result in some distortion which must be tolerated for most efficient noise limiting. Because of this,, when listening to broadcast stations or other strong local signals, the noise limiter switch should be in the "off" position unless the slight distortion is preferable to excessive pulse type noise, such as ignition interference.

3. Erratic S meter performance, lack of sufficient variation, etc., is usually due to the two 6BA6 tubes employed in the S meter circuit. These are the two 6BA6 tubes, V5 and V6, in the schematic diagram. Merely interchanging these tubes will sometimes provide sufficient improvement. Replacing one or both may be found advisable before suspecting other troubles.

4. Excessive drift, after allowing sufficient time for warm up, may be due to a poor type 6C4 tube, V3, in the diagram or 6BE6, V2, in the schematic diagram.

Ninety-nine percent of all receiver trouble has been found to be due to one or more defective tubes. This can undoubtedly be attributed to the rough handling equipments receive in shipment. Please, therefore, be sure to follow the above suggestions in addition to having all tubes tested before writing the Home Office.

# CIRCUIT THEORY

The HQ-100 is basically a single conversion, four-band, superheterodyne receiver with a noise limiter. Its circuitry incorporates a Q-Multiplier for full control of selectivity and also serves as a BFO.

## PRESELECTION

The antenna input coupling and RF amplifier stage provide the necessary preselection and gain for high performance and rejection of undesired signals. The high signal level at the mixer grid, V2, contributes to a favorable signal-to-noise ratio.

Both grid and plate circuits of the RF stage are tuned; individual tuning coils are selected for each band.

The antenna compensating compacitor, adjustable from the front panel, permits the receiver to be resonated for optimum performance with the particular antenna in use.

## CONVERTER STAGE

A high degree of oscillator stability is attained by the use of a separate mixer (6BE6), V2, and an independent oscillator (6C4), V3.

The output signal from RF amplifier V1 is heterodyned with the output of the local high frequency oscillator, V3, and electronically combined within the mixer tube, V2, On the four frequency ranges the local oscillator is 455 KCS above the signal frequency.

Low-loss tube sockets, low-loss, phenolic temperature compensating capacitors, and stable, coaxial trimmers all contribute to oscillator stability. Additional frequency stability is attained by applying regulated voltage to the oscillator circuit and by the rugged construction of the entire HF oscillator section assembly.

## Q MULTIPLIER

The Q-Multiplier circuit employed in this receiver serves a dual function. The Q-Multiplier frequency control provides a means of peaking any signal within the pass band of the IF amplifier. The degree of peaking is controlled by the SELECTIVITY control. This same SELECTIVITY control when turned completely clockwise serves as the beat frequency oscillator on-off switch. In some cases when it is desirable to have narrow band width and the beat frequency oscillator as well, it will be found that the Q-Multiplier will go into oscillation at a point below the full on position. A little experience will be necessary using the Q-Multiplier in this fashion to provide optimum performance in the crowded CW bands, or in using the receiver for single side band reception. The Q-Multiplier is generally never employed on the standard broadcast band or when short wave broadcast stations are being received. The use of the Q-Multiplier under these circumstances will only result in limiting the frequency response of the broadcast band and short wave broadcast stations in view of the very narrow band width that is provided by the Q-Multiplier. Of course, the SELECTIVITY control will make it possible to control this response characteristic. If, by chance, when receiving foreign short wave broadcast stations interference is experienced caused by two stations operating very close to one another, the Q-Multiplier may be employed under these circumstances to minimize, if not eliminate, the interference by the improved selectivity or decreased band width proper adjustment will provide. The proper use of the Q-Multiplier can actually enhance many times the results obtained with this receiver. In view of this, it is suggested that a little time be spent in learning just how to properly adjust the Q-Multiplier frequency and selectivity controls under different receiving conditions. As the Q-Multiplier SELECTIVITY control is advanced, a decided decrease in noise will be apparent. This is due to the narrowing of the pass band. On AM phone signals this control will usually be between the 7 and 11 o'clock positions. The FREQUENCY control should then be adjusted for clarity of signal or for minimum adjacent channel interference. The SELECTIVITY control may be advanced progressively more for SSB and CW reception. The more this control is advanced, the more critical the setting of the FREQUENCY control becomes. Advancing the SELECTIVITY control too far will cause the Q-Multiplier to oscillate. This should be avoided except for CW reception as mentioned above. The Q-Multiplier is a very handy tool in the hands of an experienced operator and, unfortunately, it is beyond the scope of this instruction manual to attempt to be more definite than we have.

## IF AMPLIFIER

Seven, stable tuned circuits, in two stages of IF amplification (V5 and V6), contribute to sensitivity and selectivity. Iron core permeability-tuned transformers improve performance and add to the ease of adjustment. The intermediate frequency is 455 KCS, the RETMA standard.

## AVC SYSTEM

Automatic Volume Control minimizes fading and signal strength variations by controlling the gain of the RF stage V1 and the IF stage V5. As a result, a comfortable and constant level of audio is maintained.

## "S" METER (CARRIER LEVEL)

The "S", or Tuning, Meter is provided to assist in tuning and to give an indication of relative signal strength. Because the meter readings are proportional to AVC voltage, it is operative only in the AVC position.

The meter, which is calibrated to 40 db over S-9, is factory adjusted so that a signal input of approximately 50 microvolts gives a reading of S-9. Each "S" unit indicates a 6 db increase, equivalent to doubling signal strength. Should meter readjustment be necessary:

1. Set function switch to REC.
2. Set front panel SENSITIVITY control to "10" and Q-Multiplier SELECTIVITY control to BFO.
3. With reciever off, mechanically zero pointer with a fine screwdriver.
4. With AVC on and the ANT. terminals shorted, zero pointer with ZERO ADJ potentiometer R-15.

## DETECTOR AND NOISE LIMITER

One section of the 6AL5 tube, V7, is used for the second detector and AVC system. This system produced a minimum of distortion.

The other half of V7 operates as a series, self-adjusting noise limiter. It will reduce automobile ignition and other types of impulse noise to a minimum. Intelligibility is not affected by the noise limiter, although it may be switched off if desired.

## BEAT FREQUENCY OSCILLATOR (BFO)

As mentioned previously, the Q-Multiplier serves a dual function, since it is also employed as the beat frequency oscillator. Under these conditions, with the SELECTIVITY switch in the full counterclockwise position, the Q-Multiplier is made to oscillate more vigorously. The FREQ. control is used under these conditions to vary the pitch. Each calibration division of this control represents approximately 1000 cycles. When receiving single side band transmission, the generally accepted procedure of setting the beat frequency oscillator approximately 1000 cycles above or below zero beat should be employed. In other words, if the beat frequency oscillator FREQ. control is set one degree clockwise or counterclockwise from the center position, optimum single side band reception will usually be obtained. Whether the beat frequency oscillator control will be set clockwise

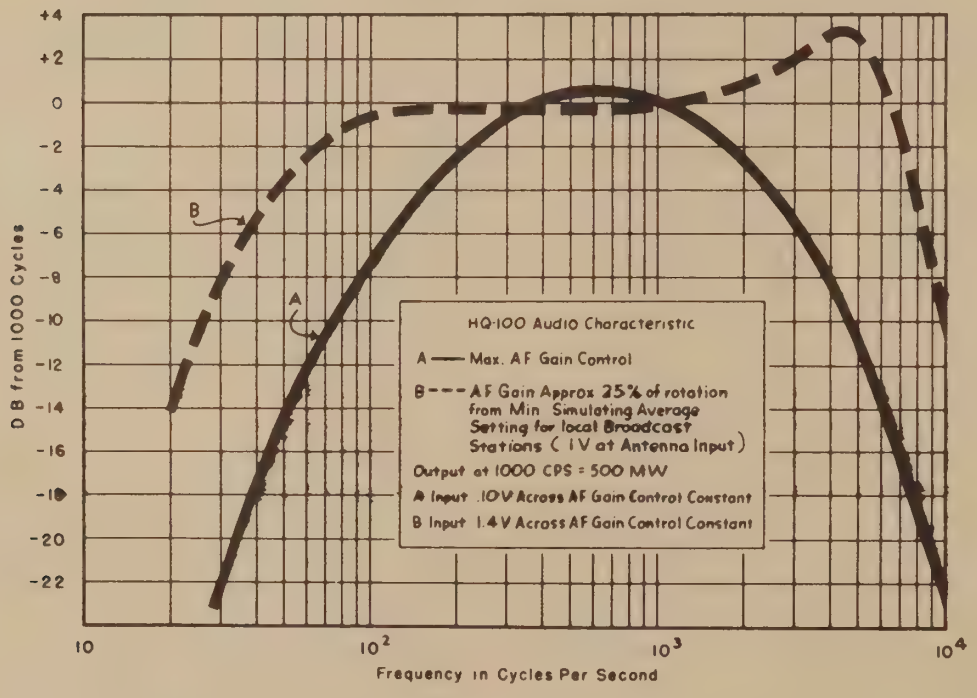



*Figure 6. Auto-Response Curve*

from zero beat will depend on whether upper or lower side band is being transmitted. If the beat frequency oscillator is on the wrong side of zero beat, it will be impossible to obtain intelligibility of the single side band signal when the band spread dial is tuned very slowly through the single side band signal. Should such a condition arise, merely rotate the FREQ. control from the one degree counterclockwise to the one degree clockwise position and then very carefully adjust the BAND SPREAD for intelligible speech. Here again experience is the best teacher. The stability of both the high frequency oscillator and the beat frequency oscillator employed in this receiver plus the excellent mechanical rigidity will provide excellent single side band reception. Refer to the above paragraph on the Q-Multiplier for improved single side band reception. For improved selectivity with BFO, the following procedure may prove advantageous. After a CW signal or single side band signal has been tuned in using the procedure previously given, if the SELECTIVITY control is very gradually rotated in the counterclockwise position, it will be found that the Q-Multiplier will continue to oscillate. Under these conditions, narrower band width with BFO injection will result.

## AUDIO AMPLIFIER

The first audio stage is a resistance coupled voltage amplifier employing the other section of the 12AX7 (V4B). The audio output stage is a 6AQ5 beam power amplifier (V8) providing an undistorted output level of at least one watt.

A feature of the audio system is the variable negative feedback employed (see Auto-Response Curve, Figure 6). Maximum feedback is provided at low settings of the AUDIO GAIN control for the fine quality reception of local broadcast and strong short wave stations. As the AUDIO GAIN control is increased, the feedback decreases so that on reception of weak signals additional selectivity is provided by the audio section. This results in an increased signal-to-noise ratio. A further advantage is the critical damping of the speaker for elimination of speaker "hangover". This upgrades the reception of speech and music and decreases the noise output of the receiver. A further advantage is the reduction of distortion at lower settings of the AUDIO GAIN control.

# ACCESSORIES

Now you can get even more out of your HQ-100 receiver! With a few minutes and an investment of only $15.95 you can get such sparkling reception of single-signal CW you won't believe your ears--that is, till you try the new BFO kit now available from your Hammarlund distributor or directly from Hammarlund Manufacturing Co. Mars Hill, North Carolina.


The new XC-455 conversion kit is a 455 KCS crystal-controlled BFO designed to be added to the second detector of the HQ-100. With the kit added, the function of selectivity control of the built-in Q-multiplier is greatly enhanced. It permits single-signal CW reception with bandwidth adjustable from approximately 3 KCS to 100 cps.

The XC-455 conversion kit is mechanically identical to the XC-100 crystal calibrator kit and differs only to the extent of the frequency of the oscillator quartz crystal provided. The installation of both units is identical with the sole exception of the termination of the output lead as described in the installation bulletin. Only one of these units may be installed on the receiver chassis. If both are desired one must be used externally.

The kit is quickly and easily installed. It is complete with easy-to-follow instructions, operating switch and mounting hardware -- and it costs only $15.95.

---

The XC-100 Crystal Calibrators is available, providing checkpoints every 100 KCS within the range of the receiver.

This is not usually required by the average short wave listener, although it will prove an aid as a means of correcting for possible dial error.

The amateur operator will find this of most value since the 100 KCS checkpoints this unit provides, will make it possible to accurately set amateur band edges. This will result in improving the accuracy of the amateur band spread dial, by determining the exact setting of the main tuning dial.

PL-38657-G5 -- $17.95

# SERVICE AND REALIGNMENT PROCEDURE

NOTE

To service this receiver, disconnect from power source and remove all leadwires attached to terminal connections at rear of chassis apron. Carefully turn the receiver up onto the front panel face on a smooth clean surface. Remove the two #10 hex machine screws at the extreme ends of the chassis apron at the rear of the cabinet, and the knob from the clock adjustment shaft if receiver is so equipped. Lift cabinet straight up and off of chassis. To reassemble, use reverse procedure.

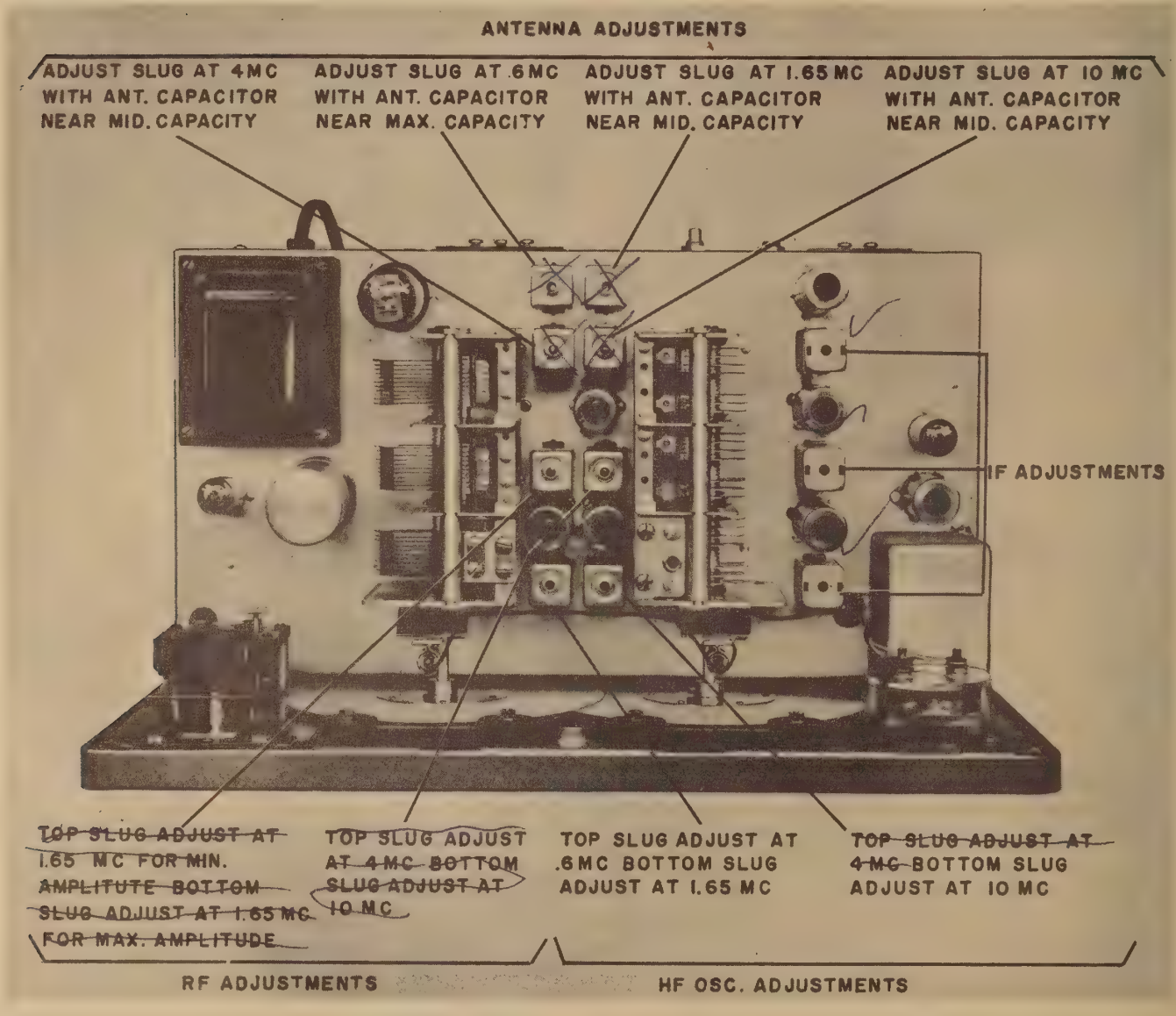



*Figure 7. Top View of Chassis*

## IF ALIGNMENT

NOTE

Use a non-metallic alignment tool such as General Cement Co. No. 5097, or equal.

a. Connect the output cable of a 455 KCS unmodulated, signal generator to the bus lead of the 6BE6 mixer grid. The frequency accuracy of the generator may be checked with sufficient precision by picking up its second harmonic (910 KCS) in any receiver whose calibration at 910 KCS has been checked as correct and then adjusting the generator frequency.

b. Connect a DC vacuum tube voltmeter, set for negative voltage reading to pin 1 of the V7, 6AL5 socket.

c. Set the receiver controls as follows:

BAND SPREAD dial on 100
Function switch on REC.
Main tuning dial on .54 MC
Noise limiter switch on OFF
AUDIO GAIN control at minimum
SELECTIVITY control on BFO
Band selector switch on .54 - 1.6 MC
MAN. -AVC switch on MAN.
SENSITIVITY control on 3 from maximum.

d. During alignment, adjust the generator output and the SENSITIVITY control to prevent overloading. Final adjustment should be made with the SENSITIVITY control at approximately the third indice from its maximum (clockwise) position. Adjust each of the three IF transformers for maximum meter reading. Topside adjustments (Figure 7) are secondaries or grid cir-

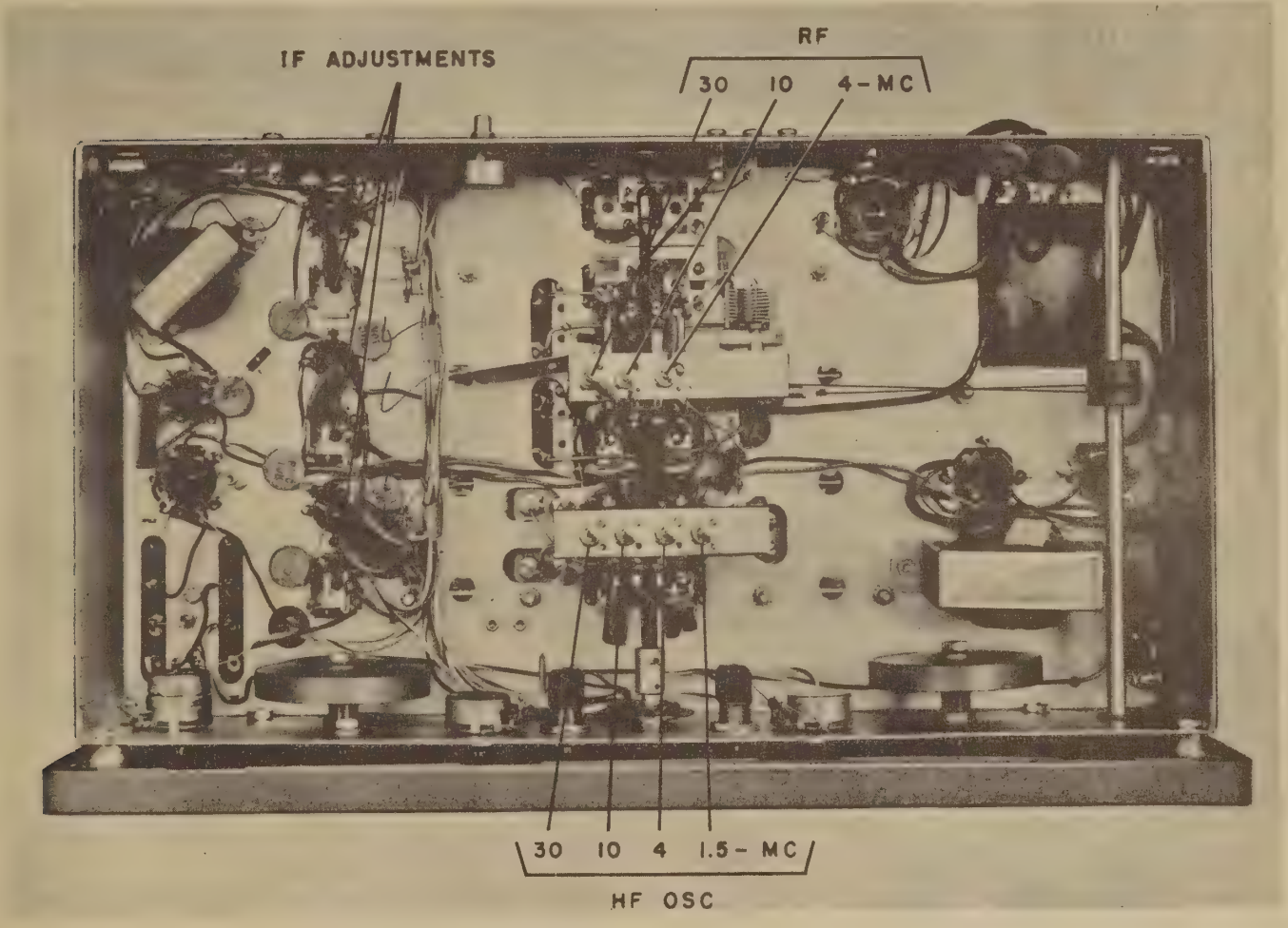



*Figure 8. Bottom View of Chassis*

cuits; bottom of chassis adjustments (Figure 8) are primaries or plate circuits.

e. Turn the function switch to Q MULT. and adjust the SELECTIVITY control counterclockwise to a position below the oscillating point. With its panel bushing nut loosened to permit the frequency shaft to turn without hindrance by the stop, adjust the FREQ. control to obtain a maximum meter indication. The input signal must be adjusted to a value just sufficient to obtain a good meter swing. This adjustment is the center frequency of the pass band and is also the zero setting for the BFO. While the meter is at maximum, turn the stop lug to a position 180 degrees directly opposite the stop pin in the frequency shaft. Holding it in this position, tighten the bushing in the nut making sure that the shaft or the stop lug have not turned by checking the zero setting.

f. With the MAN. -AVC switch on AVC, the SENSITIVITY control at maximum, with grid pin 1 of the V5 amplifier tube grounded, and with no signal input, adjust the METER ZERO ADJUST. pot at the rear of the chassis (Figure 4) for a reading of zero on the "S" meter.

## RF ALIGNMENT

NOTE

Use a non-metallic alignment tool such as General Cement Co. No. 8282, or equal.

a. The slugs and trimmers, having been factory adjusted, should require a minimum amount of adjustment for any realignment.

b. All RF and oscillator slug adjustments are made from the top of the shield cans. See Figure 7.

c. Connect the unmodulated, signal generator output cable to the antenna and ground terminals of the receiver, with the A terminal adjacent to the G terminal jumped together. See Figure 4.

d. Set the controls the same as for IF alignment above. Adjust the SENSITIVITY control as required to obtain a sufficient voltmeter reading and to prevent overloading.

e. The oscillator adjustment is made first. The RF is adjusted next to obtain maximum amplitude. The antenna slugs are adjusted last. A certain amount of interaction will occur between the oscillator and RF adjustments, particularly on the higher frequency bands. Final adjustment should be accomplished by combined or alternate adjustment of the oscillator and RF for maximum amplitude.

NOTE

The trimmer adjustments, if required, should be the final adjustment for each band. See Figure 8 for location of trimmers.

There is no RF amplifier adjustment for the .54 - 1.6 MC band.

f. Note that the oscillator frequency in the HQ-100 is always on the high side of the signal frequency by 455 MCS. Therefore, it is necessary to make sure that the oscillator frequency is not adjusted below the signal frequency which would be an image response of the signal.

g. It will be necessary to repeat low and high end alignment adjustments of each band since the adjustments are interdependent. The process should be repeated until maximum amplitude is obtained at both alignment frequencies of each band.

NOTE

The receiver should be warmed up at least one-half hour before final oscillator frequency adjustments are made for the dial calibration check.

## DIAL CALIBRATION

a. Use a crystal calibrator having 100 KCS and 1000 KCS output. Set the arbitrary band spread dial scale to 100. Set the function switch to Q MULT. Set the FREQ. control to zero (triangular indice). Set the SELECTIVITY control to BFO. Set the MAN. -AVC switch to AVC.

b. Check to see that the frequencies at or near the alignment frequencies are "on the line." If not, make minor adjustments of the slugs and trimmers (Figures 7 and 8) to make them correct.

CAUTION

Weaker signals will be observed at dial settings approximately 10 KCS above each calibration dial marking. These are image signals from 1 MC above the desired signal and may be recognized by their somewhat weaker strength and may be further reduced by proper adjustment of the gain controls. They will, of course, be more noticeable on the higher bands. Keeping the antenna tuned will help.

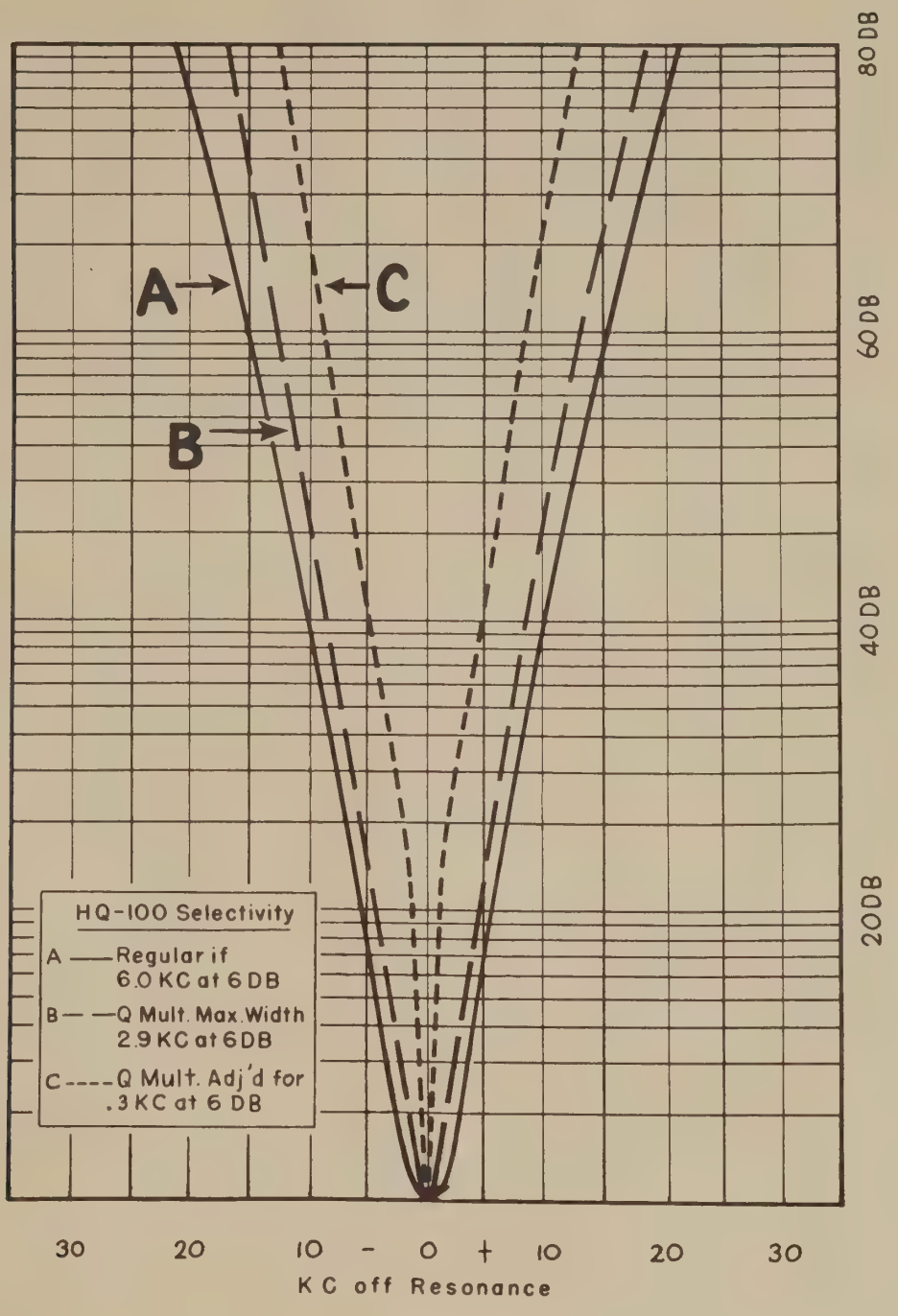



*Figure 9. Selectivity Curves*

## TABLE 1. TUBE SOCKET VOLTAGES

Measured from tube socket pins to chassis with vacuum tube voltmeter. AUDIO GAIN control minimum. Band Selector switch on 10-30 MCS. Noise Limiter switch OFF. MAN. -AVC on MAN. SENSITIVITY control maximum except where noted. Function switch on Q MULT. except where noted. SELECTIVITY control counterclockwise. Line voltage 117. No signal input.

| TUBE | SOCKET PIN NUMBERS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| V1 RF 6BZ6 | - | 1.8 | | 6.3 ac | 245 | 105 | - | - | - |
| V2 MIXER 6BE6 | -1.3 | 1.3 | - | 6.3 ac | 235 | 70 | - | - | - |
| V3 HF OSC 6C4 | 100 | - | - | 6.3 ac | 100 | .7 | - | - | - |
| V4 12AX7 Q MULT. 1st AF | 230 0 ON REC. | - | 2.7 0 ON REC. | 6.3 ac | 6.3 ac | 76 | - | .8 | - |
| V5 1st IF 6BA6 | - | - | - | 6.3 ac | 230 | 105 | 2.15 13.6 Min SENS | - | - |
| V6 2nd IF 6BA6 | - | - | - | 6.3 ac | 230 | 95 | 2.4 13.6 Min SENS | - | - |
| V7 6AL5 DET. LIM. AVC | -.2 | -.3 | - | 6.3 ac | - | - | -.2 | - | - |
| V8 6AQ5 AUDIO OUTPUT | - | 15 | - | 6.3 ac | 260 | 240 | - | - | - |
| V9 0B2 VOLTAGE REG. | 105 | - | - | - | 105 | - | - | - | - |
| V10 5Y3 RECTIFIER | - | 270 | - | 250 ac | - | 250 ac | - | 270 | - |

TABLE 2. TUBE SOCKET RESISTANCES

Measured from tube socket pins to chassis with vacuum tube ohmmeter. AUDIO GAIN control maximum. SELECTIVITY control on BFO. Noise Limiter switch ON. SENSITIVITY control maximum except where noted. MAN. -AVC on MAN. Function switch on Q MULT. Band Selector switch on 10-30 MCS.

| TUBE | SOCKET PIN NUMBERS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| V1 RF 6BZ6 | 10K 2.4 Meg on AVC | 180 | 0 | 0 | .5 Meg or more | .5 Meg or more | 0 | - | 0 |
| V2 MIXER 6BE6 | 22K | 180 | 0 | 0 | .5 Meg or more | .5 Meg or more | 0 | - | - |
| V3 HF OSC 6C4 | .5 Meg or more | INF | 0 | 0 | .5 Meg or more | 47K | 0 | - | - |
| V4 12AX7 Q MULT. 1st AF | .5 Meg or more | 2.2 Meg | 6800 18K Min Sel. | 0 | 0 | .5 Meg or more | 1 Meg | 2200 | 0 |
| V5 1st IF 6BA6 | 0 2.4 Meg on AVC | 0 | 0 | 0 | .5 Meg or more | .5 Meg or more | 180 10.2K Min Sel. | - | - |
| V6 2nd IF 6BA6 | 470K | 0 | 0 | 0 | .5 Meg or more | .5 Meg or more | 200 10.2K Min Sel. | - | - |
| V7 6AL5 DET. LIM. AVC | 2.1 Meg | 190K | 0 | 0 | .5 Meg or more | .5 Meg or more | 120K | - | - |
| V8 6AQ5 AUDIO OUTPUT | .5 Meg | 430 | 0 | 0 | .5 Meg or more | .5 Meg or more | .5 Meg or more | - | - |
| V9 0B2 VOLTAGE REG. | .5 Meg or more | 0 | INF | 0 | .5 Meg or more | INF | 0 | - | - |
| V10 5Y3 RECTIFIER | - | .5 Meg or more | - | 85 | - | 90 | - | .5 Meg or more | - |

# PARTS LIST

| Schematic Designation | Description | Hammarlund Part No. |
|---|---|---|
| | RESISTORS | |
| R1 | 22 Ohms, 1/2 W. | K19309-9 |
| R2 | Potentiometer, 10,000 Ohms | K26218-2 |
| R3 | 10,000 Ohms, 1/2 W | K19309-73 |
| R4 | 1,000 Ohms, 1/2 W | K19309-49 |
| R5 | 22,000 Ohms, 1/2 W | K19309-81 |
| R6 | 180 Ohms, 1/2 W | K19309-31 |
| R8 | 6,200 Ohms, 1/2 W | K19309-176 |
| R9 | 47,000 Ohms, 1/2 W | K19309-89 |
| R10 | 1,000 Ohms, 1/2 W | K19309-49 |
| R11 | 2.2 Megohms, 1/2 W | K19309-129 |
| R12 | 6,800 Ohms, 1/2 W | K19309-69 |
| R13 | Potentiometer, 10,000 Ohms | K15378-1 |
| R14 | 2,200 Ohms, 1/2 W | K19309-57 |
| R15 | Potentiometer, 200 Ohms | K15368-6 |
| R16 | 2,200 Ohms, 1/2 W | K19309-57 |
| R17 | 1,600 Ohms, 1/2 W 5% | K19309-210 |
| R19 | 180 Ohms, 1/2 W 5% | K19309-260 |
| R20 | 5,000 Ohms, 10 W | K19337-4 |
| R21 | 2,200 Ohms, 1/2 W | K19309-57 |
| R27 | Potentiometer, 1 Meg | K26218-3 |
| R28 | 47 Ohms, 1/2 W | K19309-17 |
| R29 | 2,200 Ohms, 1/2 W | K19309-57 |
| R30 | 100 Ohms, 1/2 W | K19309-25 |
| R31 | 430 Ohms, 1 W | K19310-212 |
| R32 | 22 Ohms, 1/2 W. | K19309-9 |
| R33 | 180 Ohms, 1/2 W | K19309-31 |
| R34 | 47,000 Ohms, 1/2 W | K19309-89 |
| R35 | 2,200 Ohms, 1/2 W | K19309-57 |
| R36 | 10 Ohms, 1/2 W | K19309-1 |
| R37 | 470K Ohms 1/2 W | K19309-113 |
| J1 | 'Phone jack | K35608-1 |
| CMC | Clock, Telechron, Auto-timer | K38874-1 |
| | CAPACITORS | |
| C1, A-C | Variable, Main tuning | P38834-1 |
| C2, A-F | Variable, Band spread | P38335-1 |
| C3 | Variable, Antenna compensator | 34454-G11 |
| C4, 5, 6, 7, 8, 9, 10, 15 | Fixed, Ceramic disc, .01mf 600 W. V. D. C. | M23034-14 |
| C11, 12, 13, 15 | Trimmer 1-8 MMF 500 W. V. D. C. | K23008-1 |
| C16, 17, 18 | Fixed, Silver mica, .001 mf 500 W. V. D. C. | K23006-1 |
| C19 | Fixed, Ceramic disc, .01 mf 600 W. V. D. C. | M23034-14 |
| C20, 21, 22, 23 | Variable, 1-8 mmf 500 W. V. D. C. | K23008-1 |
| C24 | Fixed, Silver mica, 430 mmf 300 W. V. D. C. | K23071-317 |
| C25 | Fixed, Silver mica, 1300 mmf 500 W. V. D. C. | K23072-60 |
| C26 | Fixed, Silver mica, 3000 mmf 500 W. V. D. C. | K23072-7 |
| C27 | Fixed, Silver mica, 1100 mmf 500 W. V. D. C. | K23011-59 |
| C28 | Fixed, Silver mica, 3300 mmf 500 W. V. D. C. | K23011-43 |
| C29 | Fixed, Silver mica, 510 mmf 500 W. V. D. C. | K23003-74 |
| C30, 31, 32 | Fixed, Ceramic disc, .01 mf 600 W. V. D. C. | M23034-14 |
| C33 | Fixed, Ceramic disc, .04 mf 600 W. V. D. C. | M23034-12 |
| C34, 35, 36 | Fixed, Ceramic Disc, .01 mf 600 W. V. D. C. | M23034-14 |
| C38 | Fixed, Three-section electrolytic | K15504-62 |

| Schematic Designation | Description | Hammarlund Part No. |
|---|---|---|
| | CAPACITORS (continued) | |
| C38A | 20 mf 450 W. V. D. C. (Part of K15504-62) | |
| C38B | 20 mf 450 W. V. D. C. (Part of K15504-62) | |
| C38C | 25 mf 50 W. V. D. C. (Part of K15504-62) | |
| C41 | Fixed, Ceramic disc, .01 mf 600 W. V. D. C. | M23034-14 |
| C42 | Fixed, Ceramic disc, .005 mf 1000 W. V. D. C. | M23034-10 |
| C43, 44 | Fixed, Ceramic disc, .01 mf 1400 W. V. D. C. | M23034-26 |
| C45, 46 | Fixed, Ceramic disc, .045 mf 600 W. V. D. C. | M23034-12 |
| C47 | Fixed, Discap, temperature compensating, 12 mmf | K23010-2 |
| C48 | Fixed, Ceramic disc, .01 mf 600 W. V. D. C. | M23034-14 |
| C49, 50 | Fixed, Discap, temperature compensating, 2.7 mmf | K23010-1 |
| C51 | Fixed, Discap, temperature compensating, 6.8 mmf | K23010-3 |
| C52 | Fixed, Ceramic, temperature compensating, non-insulated, 1.5 mmf | K23061-208C |
| C53 | Fixed, Silver Mica - 5 mmf | K-23006-5 |
| | COILS | |
| L1 | R. F. Coil Assembly (Bands 1 and 2) | K38816-1 |
| L2 | R. F. Coil Assembly (Bands 3 and 4) | K38817-1 |
| L3 | H. F. Osc. Coil Assembly (Bands 1 and 2) | K38818-1 |
| L4 | H. F. Osc. Coil Assembly (Bands 3 and 4) | K38819-1 |
| L5 | Coil & Ferrule Assembly | K26215-G2 |
| L6 | Choke, Filter, 13 Henries at 65 ma D. C. | K38827-1 |
| | TRANSFORMERS AND IMPEDANCE ASSEMBLIES | |
| T1 | Antenna Transformer Assembly (Band 1) | K38812-1 |
| T2 | Antenna Transformer Assembly (Band 2) | K38813-1 |
| T3 | Antenna Transformer Assembly (Band 3) | K38814-1 |
| T4 | Antenna Coil Assembly (Band 4) | K38815-1 |
| T5, 6, 7 | Transformer, 1st, 2nd, and 3rd I. F. | K38829-1 |
| T8 | Transformer, Output, Max power 5W, impedance match; 10,000 Ohms plate to 4 Ohms voice coil | K38828-1 |
| T9 | Transformer, Power, Primary 115V-60 cycle, Secondary 250-0-250V - 90 ma. | P38826-1 |
| T9A | Power Transformer 110-220 V Primary | P38826-2 |
| Z1 | RC Printed Network | K38846-1 |
| Z2 | RC Printed Network | K38885-1 |
| | SWITCHES | |
| S1A, S1B | Switch Wafer RF | K38824-1 |
| S1C | Switch Wafer HF OSC | K38824-1 |
| S2 | Power-On-Off, SPST (Part of R13, K15378-1) | |
| S3 | OFF-REC-Q MULT., Single section, four position | K38848-1 |
| S4 | MAN. -AVC, SPST | K38857-1 |
| S5 | LIMITER, SPST | K38857-1 |
| 11, 2 | Lamp, Pilot, No. 47, 6.3V, .15A | K16004-1 |
| M1 | Meter, "S" (Carrier Level) | K26149-4 |

# ADDITIONAL HINTS FOR THE NOVICE AND SHORT WAVE LISTENER

A voltage reading of 45 - 50 volts may be obtained between the chassis and a ground as the result of the two power line by-pass condensers that are connected across the power line with the center tap grounded. Since we are dealing with AC, these capacitors will look like resistors to a volt meter. This will also produce a slight shock if the chassis is not grounded, and one happens to contact a grounded object, and the chassis or any exposed part of the receiver. This also will account for a slight spark, if the receiver is connected to the power line and the ground connection is made. For protection a good ground should always be employed.

In using the receiver for CW, or in other words, with the BFO or the Q multiplier in the oscillating state, it is absolutely necessary to take the receiver out of the AVC position and put it into the Manual position. Failure to do this will result in the receiver blocking and erratic action of the S meter. The S meter is only usable in the AVC position. When using BFO or Q multiplier in oscillating state, the audio control should be used at 2/3 to 3/4 rotation clockwise position and the RF sensitivity control employed as a means of adjusting volume.

When employing the Q multiplier for phone use the function switch will, of course, be in the Q multiplier position and it is advisable to start with the Q multiplier selectivity control in the complete counter clock wise position. If this control is advanced past approximately the 2 o'clock position, the Q multiplier may go into oscillation resulting in the blocking of the receiver. For use on phone the Q multiplier selectivity control, will also usually be employed between maximum counter clock wise position and approximately straight up. Beyond this point or even at approximately the straight up position the receiver is usually so selective that it is capable of wiping the modulation off the carrier by actually rejecting the side bands. For normal phone use or broadcast reception the selectivity control should always be employed in the BFO or clock wise position, since this results in the operation of a switch which disconnects the Q multiplier from the IF system and makes it ready to act as a BFO when the function switch is turned to the Q multiplier position. In other words, if it is desirable to use the BFO to locate a station when tuning for weak signals, after the phone carrier is tuned in, merely rotate the function switch from the Q multiplier position to the Receive position which will result in turning off the BFO for phone reception. If interference is experienced either between stations close to one another, or an interfering CW signal, first turn the Q multiplier selectivity control completely counter clock wise, then the function switch to the Q multiplier position. Gradually advance the Q multiplier selectivity control which will result in increasing the selectivity by producing a spike or narrow band width that is adjustable from approximately 3 kc to 100 cycles in width. This spike can be moved around within the IF pass band that is nominally approximately 6 kc wide. The frequency control is the means for varying the position of this spike. Assuming that the selectivity control is adjusted to produce a spike 1 kc wide and also assuming that the band width of the IF system is 6 kc wide, it can be appreciated that the shape of the IF system response curve can be varied by moving the 1 kc band width anywhere within the 6 kc band width. This will produce a valley on either side of the spike or peak. By proper tuning, therefore, of the band spread dial and the frequency control of the Q multiplier, it should be apparent that an interfering signal may be placed in a valley and the desired signal on the peak, with the net result of decreasing the strength or eliminating the signal that is in the valley, without seriously affecting the desired signal intelligibility.

Since the use of the Q multiplier naturally means narrower band width, it should only be employed when interference is present. Never use the Q multiplier on the broadcast band unless you are hunting weak DX signals and are therefore not after maximum fidelity response. The same, more or less, applies to short wave broadcast listening. Here the use of the Q multiplier in addition to functioning as previously described may also prove advantageous from a noise reduction standpoint as a direct result of the decreased band width.

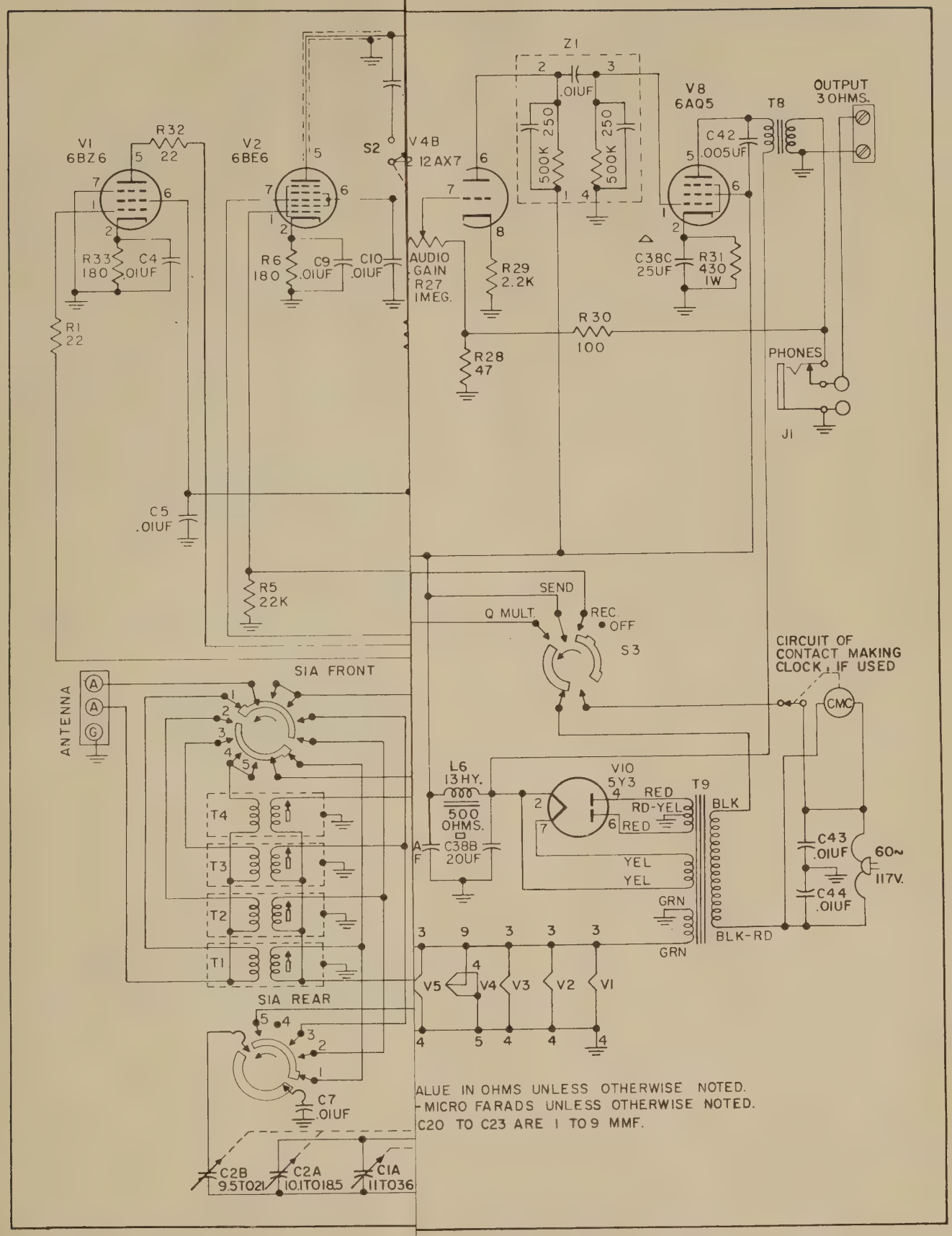



*Figure 10. Hammarlund HQ-100 Receiver, Schematic Diagram*

# ADDITIONAL HINTS FOR THE NOVICE AND SHORT WAVE LISTENER

A voltage reading of 45 - 50 volts may be obtained between the chassis and a ground as the result of the two power line by-pass condensers that are connected across the power line with the center tap grounded. Since we are dealing with AC, these capacitors will look like resistors to a volt meter. This will also produce a slight shock if the chassis is not grounded, and one happens to contact a grounded object, and the chassis or any exposed part of the receiver. This also will account for a slight spark, if the receiver is connected to the power line and the ground connection is made. For protection a good ground should always be employed.

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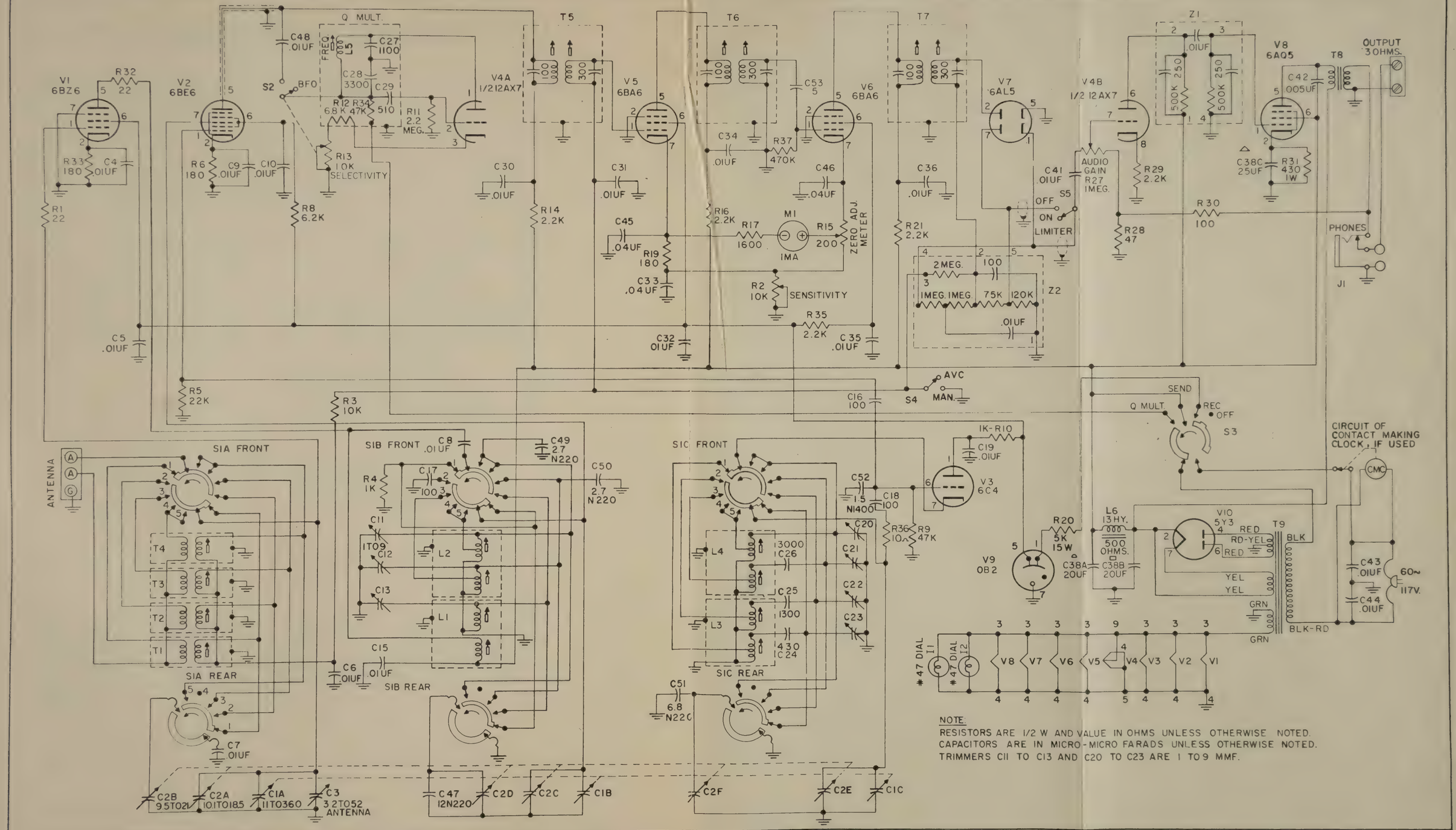



NOTE:
RESISTORS ARE 1/2 W AND VALUE IN OHMS UNLESS OTHERWISE NOTED.
CAPACITORS ARE IN MICRO-MICRO FARADS UNLESS OTHERWISE NOTED.
TRIMMERS C11 TO C13 AND C20 TO C23 ARE 1 TO 9 MMF.

*Figure 10. Hammarlund HQ-100 Receiver, Schematic Diagram*

## THE HAMMARLUND MANUFACTURING COMPANY
### Standard Warranty

The Hammarlund Manufacturing Company, warrants this equipment to be free from defects in workmanship and materials under normal and proper use and service for the uses and purposes for which it is designed, and agrees to repair or replace, without charge, all parts thereof showing such defects which are returned for inspection to the Company's factory, transportation prepaid, within a period of 90 days from date of delivery, provided such inspection discloses to the satisfaction of the Company that the defects are as claimed, and provided also, that the equipment has not been altered, repaired, subjected to misuse, negligence or accident, or damaged by lightning, excessive current or otherwise, or had its serial number or any part thereof altered, defaced, or removed. Tubes shall be deemed to be covered by the manufacturer's standard warranty applicable thereto, and such items shall be and are hereby excluded from the provisions of this warranty. Pilot lamps and fuses are not guaranteed for length of service.

Except as herein specifically provided, no warranty, express or implied, other than that of title, shall apply to any equipment sold hereunder. In no event shall the Company be liable for damages by reason of the failure of the equipment to function properly or for any consequential damages.

This Warranty is valid for the original owner of the equipment, and is contingent upon receipt of the Warranty Registration Card by the Company. No equipment shall be returned to the factory for repairs under warranty unless written authorization is obtained by the Company, and the equipment is shipped prepaid by the owner. The Company maintains Authorized Service Stations, names and locations of which will be sent upon request of the owner.


The Hammarlund Manufacturing Company
*A Giannini Scientific Co.*
53 West 23rd Street, New York 10, N. Y.
Export Department: 13 East 40th Street, New York 16, N. Y.


The policy of the Hammarlund Manufacturing Company, is one of continued improvement in design and manufacture wherever and whenever possible, to provide the highest attainable quality and performance. Hence, specifications, finishes, etc. are subject to change without notice and without assumption by Hammarlund of any obligation or responsibility to provide such features as may be changed, added or dropped from previous production runs of this equipment.

**DO NOT MAKE ANY RETURNS WITHOUT AUTHORIZATION FROM EITHER NEW YORK OFFICE OR FACTORY. ALL AUTHORIZED RETURNS SHOULD BE SHIPPED TO FACTORY, HAMMARLUND MANUFACTURING CO., MARS HILL, NORTH CAROLINA. DO NOT SHIP TO NEW YORK OFFICE.**

ESTABLISHED 1910

Marshall A. Brooks
9 White Oaks Drive
663-4435

# HQ-100A COMMUNICATIONS RECEIVER

TECHNICAL DESCRIPTION AND OPERATING INSTRUCTIONS

HAMMARLUND

Hammarlund Manufacturing Company
*A Giannini Scientific Co.*
73-88 HAMMARLUND DRIVE
MARS HILL, NORTH CAROLINA

9001-06-00005

ESTABLISHED 1910

# IMPROVE PERFORMANCE WITH THE HAMMARLUND


# CRYSTAL CALIBRATOR

**The new XC-100 Crystal Calibrator provides check points every 100 KCS within the range of the receiver. The XC-100 employs stable low-drift 100 KCS quartz crystal and 6BZ6 pentode. Trimmer capacitor provides adjustment for zero beat against primary frequency standard (WWV).**

*Price:*

*PL-38657-G1 General usage* — **$15.95**
*PL-38657-G2 for HQ-129-X and HQ-140-X* — **$17.95**
*PL-38657-G4 for SP-600* — **$17.95**

## *INSTRUCTIONS FOR INSTALLATION OF HAMMARLUND XC-100 CALIBRATOR IN HAMMARLUND HQ AND SP-600 SERIES COMMUNICATIONS RECEIVERS AND GENERAL COMMUNICATIONS RECEIVERS*

### GENERAL COMMUNICATIONS RECEIVERS

The XC-100 Calibrator Unit measures 1⅝" x 2" x 3⅛" high overall including tube and crystal. It may be mounted in any position or location where space is available on the receiver chassis. Avoid locations close to hot tubes.

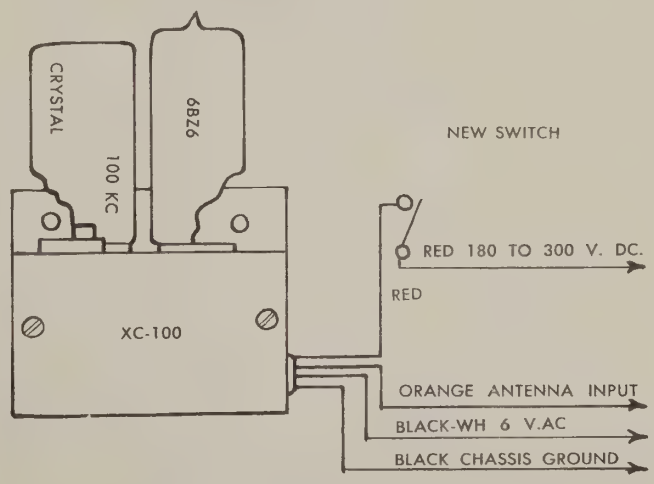
Two mounting holes, 1⅜" on centers, are provided in the flange of the calibrator shield cover. These holes will accommodate #6 machine screws.

Remove the receiver from its cabinet or rack and assemble the calibrator unit to the chassis. Locate and install the toggle switch furnished with the unit and its indicator switch plate on the front panel, or wherever desired.

Dress the wire leads of the unit to the correct length, strip and tin the ends to provide for connections as shown in the accompanying sketch. The portion cut from the red wire may be used to connect from the switch to the nearest point in the chassis where B+ potential is available. The toggle switch will mount in a 15/32 inch or ½ inch diameter hole.

Allow the normal warm-up time for the receiver and tune for a signal of known frequency, such as WWV at 5.0 mcs. and with the beat frequency oscillator of the receiver turned off, adjust the trimmer on the XC-100 calibrator for zero beat against the 5.0 mcs. signal. This should be done while the tone modulation of the standard frequency signal is off.

Replace the receiver in its cabinet or rack. No further adjustment of the XC-100 unit should be required under normal service conditions.




The calibrator in conjunction with the beat oscillator of the receiver should provide good signal strength at every 100 kcs. interval within the tuning range of the receiver.

The orange antenna lead wire from the calibrator is isolated within the unit by a series 8 mmf. capacitor and may be permanently connected to the antenna input of the receiver without affecting its normal performance.

## HQ SERIES RECEIVERS

The XC-100 Calibrator Unit is designed so that it may be easily installed on the top of the tuning unit shield cover employing the mounting plate adaptor provided with the calibrator kit.

To install same in the HQ type receiver, remove the three screws at each side of the front panel and the three screws at the rear of the cabinet, then removing the receiver from the cabinet or rack.

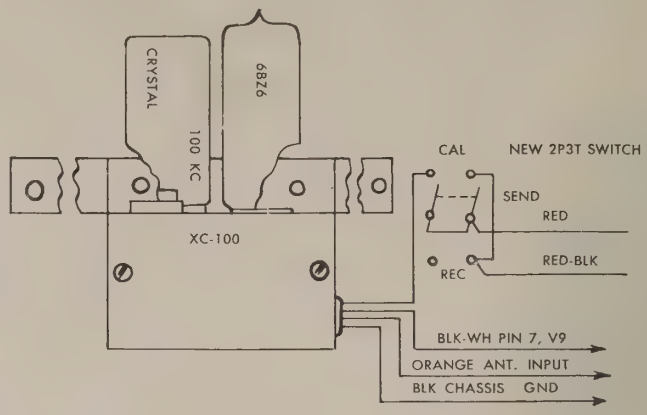
Remove the two rear screws of the tuning unit shield cover. Assemble the calibrator unit to the mounting plate adaptor provided with the kit, using the flat head screws, nuts and washers supplied.

Secure the assembly of the calibrator and adaptor bracket to the top of the tuning unit shield using the previously removed screws and with the lead wires turned toward the left side of the receiver viewed from the front.

Pass the four lead wires of the calibrator through the hole in the rear skirt of the chassis. Unsolder the two leads of the send-receive switch and remove this switch from the front panel of the receiver. Replace same with the new switch supplied with the calibrator kit, securing the new three position plate under the nut on the front panel.

Dress the wire leads of the unit to the correct length, strip and tin the ends to provide for conections as shown in the accompanying sketch. Make the electrical connections indicated in the sketch. Unsolder the lead wires of the receiver from the original send-receive switch and transfer the lead wires to the new switch installed. Make certain the switch is connected as shown, including the two jumper connections, which may be made with a portion of the wire cut off from the calibrator lead wires.

Replace the receiver in the cabinet or rack and replace the front panel screws. Note that the rear center screw should be omitted to avoid crushing of the calibrator lead wires. The two other back-side screws should be replaced.




Allow the normal warm-up time for the receiver and tune for a signal of known frequency, such as WWV at 5.0 mcs. and with the beat frequency oscillator of the receiver turned off, adjust the trimmer on the XC-100 calibrator for zero beat against the 5.0 mcs. signal. This should be done while the tone modulation of the standard frequency signal is off. No further adjustment of the XC-100 unit should be required under normal service conditions.

The calibrator in conjunction with the beat oscillator of the receiver should provide good signal strength at every 100 kcs. interval within the tuning range of the receiver.

The orange antenna lead wire from the calibrator is isolated within the unit by a series 8 mmf. capacitor and may be permanently connected to the antenna input of the receiver without affecting its normal performance.

## SP-600 SERIES RECEIVERS

The XC-100 Calibrator Unit is designed to mount under the two rear screws on the right side of the RF tube plate adjacent to the power transformer in all SP-600 receivers.

The crystal used in the calibrator has an operating temperature range of from minus 40 to plus 70 degrees C.

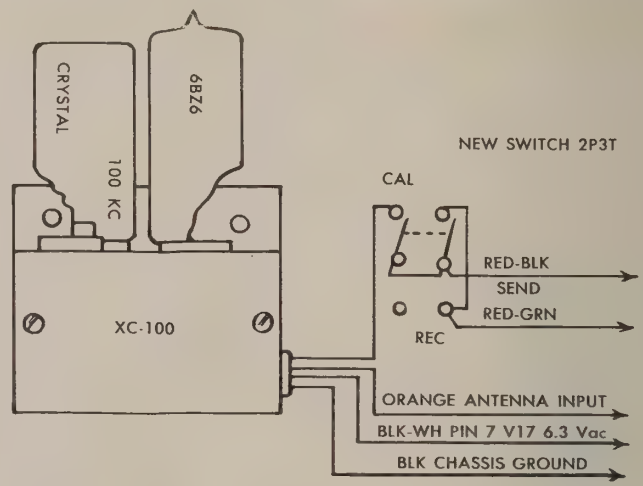
Assemble the calibrator unit to the mounting plate, employing the flat head screws, lock washers and nuts supplied with the kit. Carefully remove the 6BZ6 tube and crystal from the calibrator unit and remove the two screws from the RF tube plate. Secure the unit in position, using these same screws.

Pass the black-white, black and red wires of the unit down between the tuning unit and the chassis to the underside of the chassis. Keep the orange lead wire up and to the rear of the chassis for direct connection to the antenna input of the receiver.

Dress the wire leads of the unit to the required lengths, strip and tin the ends and solder the connections as follows:

Connect the black-white lead to Pin 7 of Socket V17, and the black lead to chassis ground. Connect the orange lead to the ungrounded side of the antenna input. This lead is isolated by a series 8 mmf. capacitor within the unit and may be left permanently connected to the antenna input without affecting the normal performance of the receiver.

Remove the send-receive switch, S9, from the front panel and carefully unsolder the two leads connected to it. Using these same leads and the red lead wire from the calibrator, connect the new two-pole, three position switch provided with the kit, as shown in the accompanying diagram. Note that for wiring this switch, the terminals are reversed in direction with respect to the switch handle. The red lead should be connected to the terminal on the opposite end from the keyway slot. After wiring the switch, install same with the new three-position switch plate under the nut on the front panel. Replace the tube and crystal in the calibrator.




Allow the normal warm-up time for the receiver and tune for a signal of known frequency, such as WWV at 5 mcs. and with the beat frequency oscillator turned off, adjust the trimmer on the XC-100 calibrator for zero beat against the 5.0 mcs. signal. This should be done while the tone modulation of the standard frequency signal is off.

Replace the receiver in its cabinet or rack. No further adjustment of the XC-100 unit should be required under normal service conditions.

The calibrator in conjunction with the beat oscillator of the receiver should provide good signal strength at every 100 kcs. interval within the tuning range of the receiver.

HAMMARLUND

ESTABLISHED 1910

**HAMMARLUND MANUFACTURING COMPANY, INC.,** 460 West 34th Street, New York 1, New York

International Division: 103 East 10th Street, New York 16, New York



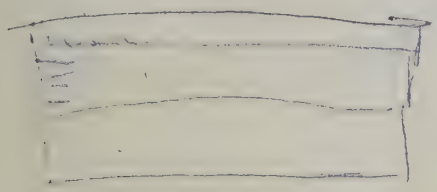
4-25M-56

Bulletin No. APD-285

# An SWL STANDOUT

## General Coverage with the

# HAMMARLUND HQ-100A

★ **VERSATILE** — Continuously tunable from 540 KCS to 30 MCS with sensitivity and selectivity surpassing anything in its class.

★ **BANDSPREAD** — Electrical bandspread tuning with unequalled direct dial calibration. Dial markings every 10 KCS on 80, 40, and 20 meter bands; every 20 KCS on 15 meter band and every 50 KCS on 10 meter band.

★ **Q-MULTIPLIER** — Permits continuously variable selectivity to meet all operating conditions.

★ **STABLE** — Voltage-regulated and temperature-compensated high-frequency oscillator for extra stability.

★ **AUTO-RESPONSE** — Automatically adjusts audio response to fit receiving conditions.

★ **AUTOMATIC NOISE LIMITER** — Minimizes static bursts and ignition interference.

★ **CIRCUIT** — 10-tube superheterodyne circuit.

★ **BEAT FREQUENCY OSCILLATOR** — Variable from zero beat to ±4 KCS.

★ **CONSTRUCTION** — Rugged die-cast aluminum front panel and heavy-gauge chassis and cabinet.

★ **WARM-UP TIMER** — Automatically turns on receiver at any pre-determined time.*

* Optional Feature

HAMMARLUND'S never-ending search to improve receiver performance has been rewarded—the HQ-100A, a redesigned version of the world-famous HQ-100, offers the discriminating amateur the best dollar value on the market today.

One of the many stand-out features of this new receiver is the Auto-Response circuit which makes possible a complete range of audio output from the sharp response required in communications work to the broad response required in high fidelity broadcast reception. This function is entirely automatic within the receiver and will work with any speaker of reasonable impedance match to the receiver. In the broad response range, the HQ-100A eliminates speaker "hangover" and resonance transients generated by the speaker, thus providing better sound from any speaker.

Sensitivity and selectivity of the HQ-100A place it in the really "hot" class. Selectivity may be continuously varied by means of a specifically-designed Q-Multiplier while the electrical bandspread feature provides accurate tuning in the most crowded parts of the radio spectrum within the range of the receiver.

The HQ100A now contains a separate variable BFO which is independent of the Q-Multiplier, permitting simultaneous use of both. Results in improved CW and SSB reception.

The unique front panel and cabinet design result in a sturdy, attractive receiver that looks right in the living room, den, or radio shack. An optional built-in Telechron automatic clock-timer permits the operator to meet pre-arranged listening schedules with a thoroughly warmed-up receiver.

For the short-wave listener, for the novice, and even the most critical amateur, the HQ-100A offers the most wanted features—and most important of all—*at a popular price.*

# HQ-100A SPECIFICATIONS

**FREQUENCY RANGE** ..... 540 KCS to 30 MCS in four bands.

**CALIBRATED BANDSPREAD** ..... Dial markings every 10 KCS on 80, 40, and 20 meter bands; every 20 KCS on 15 meter band; every 50 KCS on 10 meter band. Plus 0-100 arbitrary logging scale. Citizens band channel markings supplied for use at operator's discretion.

**MAXIMUM AUDIO OUTPUT** ..... 1.0 Watt (Undistorted).

**OUTPUT IMPEDANCE** ..... 3.2 ohms (EIA standard).

**AVC ACTION** ..... Operates on RF and IF stages. Provides fast, smooth action.

**VARIABLE SELECTIVITY** ..... One position for high quality broadcast. One position for Q-Multiplier continuously variable from 100 CPS to 3 KCS.

**SENSITIVITY** ..... 1.0 μVolt or better produces 10-1 signal-to-noise ratio.

**ANTENNA INPUT** ..... 100 ohms nominal.

**ANTENNA COMPENSATOR** ..... Permits compensation for loading effects of various type antennas, or balanced transmission line.

**BEAT FREQUENCY OSCILLATOR** ..... Variable from zero beat to ± 4 KCS.

**TUBE COMPLEMENT** .....

| | | | |
|---|---|---|---|
| RF Amplifier | 6BZ6 | First AF Amplifier | |
| Mixer | 6BE6 | Q-Multiplier | 12AX7 |
| HF Oscillator | 6C4 | Audio Power Output | 6AQ5 |
| 1st IF Amplifier | 6BA6 | Voltage Regulator | OB2 |
| 2nd IF Amplifier | 6BA6 | Rectifier | SOLID STATE |
| Detector, Series Noise Limiter, BFO | 6BV8 | | |

**POWER SUPPLY** ..... 117/230V AC, 50-60 CPS.

**"S" METER** ..... Calibrated 1 to 9 in steps approximately 6 db. Also includes db scale above S-9 to + 40 db.

**NOISE LIMITER** ..... New series type which provides better limiting action with minimum effect on modulation.

**FRONT PANEL EQUIPMENT** .....

- Main Tuning
- Bandspread Tuning
- Sensitivity (RF Gain)
- Audio Gain
- Antenna (Compensator)
- Tuning Range (Selector)
- ON-OFF Switch, Send-Receive,
- Q-Multiplier
- CW Tone (BFO Pitch)
- Limiter On-Off Switch
- "S" Meter

**REAR PANEL EQUIPMENT** .....

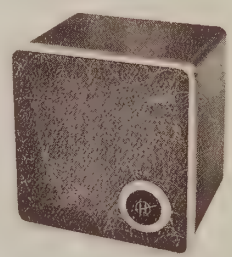
- Terminal for speaker connections.
- Terminal for antenna and ground connections.
- Phone Jack

**DIMENSIONS** .....

16¼" long, 9-7/16" high, 9⅛" deep.
Weight: 26 lbs.
Shipping Wt.: 30 lbs.
Specifications subject to change without notice.

### 24 HOUR CLOCK-TIMER

Combination 24 hour clock and automatic timer. Aids in meeting prearranged schedules. Optional accessory. Space in front panel provided.



### SPEAKER

Matching 6 x 9" speaker. Extended range. 8 watt capacity. Housed in attractive metal cabinet. 9-5/8" wide, 9-5/8" high, 7" deep. (Optional accessory)

Established 1910

# HAMMARLUND

## MANUFACTURING COMPANY

73-88 HAMMARLUND DRIVE, MARS HILL, NORTH CAROLINA 28754
704-689-5411 / TWX 510-935-3553 / CABLE: SUPERPRO - NEW YORK
EXPORT DIVISION — 13 E. 40th STREET, NEW YORK, N. Y. 10016

A GIANNINI SCIENTIFIC COMPANY

*INDUSTRIAL, AMATEUR, COMMERCIAL AND MILITARY COMMUNICATIONS EQUIPMENT / VARIABLE AIR CAPACITORS*

# THE HQ-100A SERIES COMMUNICATIONS RECEIVERS

INSTRUCTION AND SERVICE INFORMATION

ESTABLISHED 1910

ISSUE 3

In order to receive the full unconditional 90-day warranty against defective material and workmanship in this receiver, the warranty card must be filled out and mailed within two weeks of purchase. Please refer to serial number of warranty in correspondence.

**THE HAMMARLUND MANUFACTURING CO.**
73-88 Hammarlund Drive
Mars Hill, North Carolina 28754


***Figure 1. The HQ-100A Receiver***

TUBE AND DIODE COMPLEMENT

| Symbol | Type | Tube | Function |
|---|---|---|---|
| V1 | 6BZ6 | Pentode | RF Amplifier |
| V2 | 6BE6 | Pentagrid Converter | Mixer |
| V3 | 6C4 | Triode | HF Oscillator |
| V4A | 1/2 12AX7 | Triode | First AF Amplifier |
| V4B | 1/2 12AX7 | Triode | Q-Multiplier |
| V5 | 6BA6 | Remote Cutoff Pentode | First IF Amplifier |
| V6 | 6BA6 | Remote Cutoff Pentode | Second IF Amplifier |
| V7 | 6BV8 | Twin Diode, Triode | Detector, Series Noise Limiter, BFO |
| V8 | 6AQ5 | Beam Power Amplifier | Audio Power Output |
| V9 | OB2 | Gas Filled Diode | Voltage Regulator |
| CR1 | Cer 72c | Diode, Silicon | Rectifier |
| CR2 | Cer 72c | Diode, Silicon | Rectifier |

# INTRODUCTION

The Hammarlund HQ-100A is an all-new communications receiver representing entirely new concepts in electrical and mechanical design. It will provide years of top performance with minimum maintenance. The HQ-100A series receivers have a self-contained power supply and a universal transformer capable of operation from a 117 volt 60 cp/s or 220/230 volt 50/60 cp/s source, provided the proper adapter plug (P2) is installed.

The HQ-100A is a superheterodyne receiver with a frequency coverage continuously tunable from 540 KCS to 30 MCS with extremely fine control in separation of crowded signals. A very high signal-to-noise ratio plus the famous Hammarlund noise limiter circuit, permits full use of the receiver's excellent sensitivity on the weakest signals. A Q-Multiplier is provided for varying the selectivity of the receiver.

Red segments on the main tuning dial indicate wherein the majority of the international short wave stations can be located.

Electrical band spread tuning is provided with direct calibration every 10 KCS on 80, 40, and 20 meter bands; every 20 KCS on the 15 meter band and every 50 KCS on the 10 meter band. In addition, an arbitrary band spread logging scale is provided for use throughout the tuning range of the receiver. CB Channels are also indicated.

A new audio output circuit feature is the Auto-Response which automatically narrows and widens the frequency range of the audio output, depending upon the gain required. This feature permits the receiver to be used as a high-fidelity receiver on stronger signals, while providing the sharp cutoff required in receiving communication signals. A second advantage of the Hammarlund Auto-Response is the rapid damping of the audio power in the speaker voice coil which greatly minimizes undesirable speaker "hangover." The receiver may be used with either speaker or headphones. Fast acting AVC maintains a constant audio level. Adequate filtering practically eliminates AC power ripple.

The HQ-100A is equipped with a stable beat frequency oscillator which provides the operator with a continuous range of audio tones when receiving telegraph code signals, or excellent single-side band reception.

An "S" meter is provided to obtain accurate reading on received phone signals and to assure "on-the-nose" tuning. A send-receive switch is provided to silence the receiver while transmitting.

Large, comfortable controls in logical groupings are provided for greatest operating ease. The new futuristic front panel is clearly marked to permit full attention to the operating at hand.

The HQ-100A was designed with you in mind. You'll have many hours of pleasure and use in operating this truly fine communications instrument.

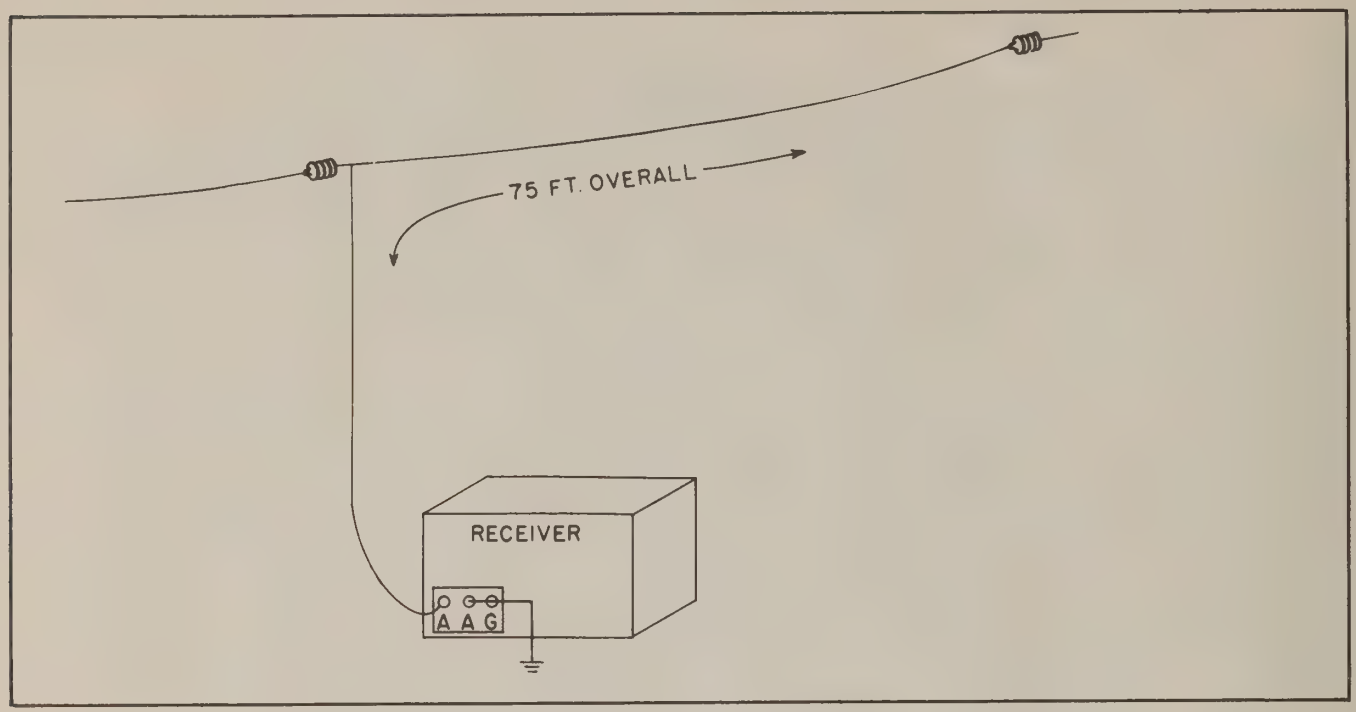



*Figure 2. Installation of Single-wire Antenna*

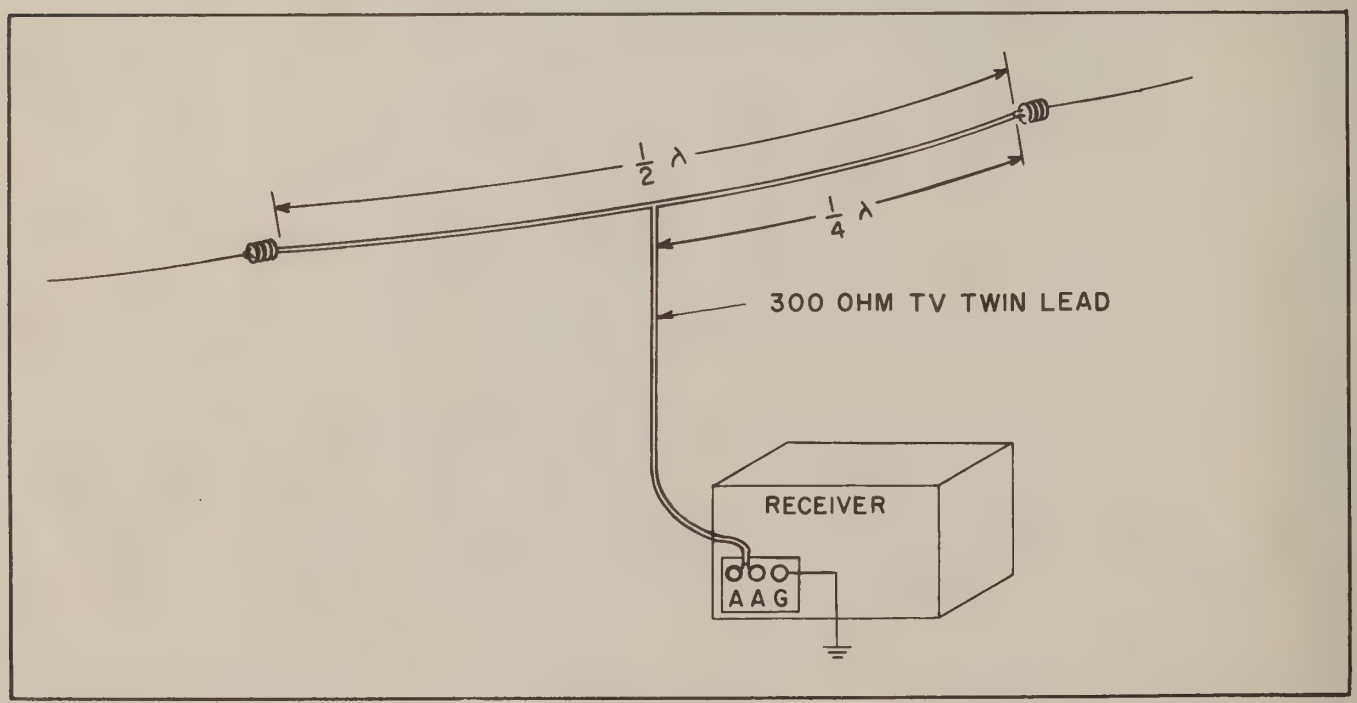



*Figure 3. Installation of Folded Dipole Antenna*

# INSTALLATION

## UNPACKING

Unpack the receiver carefully. Make sure the tubes, associated tube shields and pilot lamps are in place.

## SPEAKER CONNECTION

Connect a 3.2 ohm permanent magnet dynamic speaker (Hammarlund S-100 Speaker) to the two terminals marked SPKR. on the rear of the chassis. (Note Figure 4). For best performance do not place speaker on top of receiver cabinet.

## POWER CONNECTIONS

Before inserting attachment plug into power outlet, make certain power source is of proper voltage and frequency. (Refer to paragraph one of INTRODUCTION.)

## INSTALLING ANTENNA

The HQ-100A is designed to operate with a single wire or a balanced type antenna. The front panel antenna trimmer control (Figure 5) permits a good match to most antennae systems of 50 to 600 ohms.

For general coverage, single wire antennae of 20 to 50 feet length will provide surprisingly good reception. A long single wire outdoor antenna, such as shown in Figure 2, will generally provide entirely satisfactory performance. This wire may be 50 to 150 feet long.

For best reception, the antenna should be isolated as much as possible from neighboring objects and at right angles to power lines or busy highways so as to minimize possible interference pickup.

Optimum performance on a particular amateur band or other narrow tuning range will be obtained by using a tuned half-wave dipole or folded dipole fed with 300 ohm transmission line or other suitable lead-in, as shown in Figure 3.

To tune the one-half wave length dipole, the following formula for the length of the antenna may be used:

$$\text{Length (feet)} = \frac{468}{\text{Freq. (MCS)}}$$

Each half (1/4 wave length) is half the length found from the above formula.

A good ground, although not always necessary, will generally aid in reception and reduce stray line hum. Reversal of polarity of power cord plug may possibly further reduce line hum in some locations.

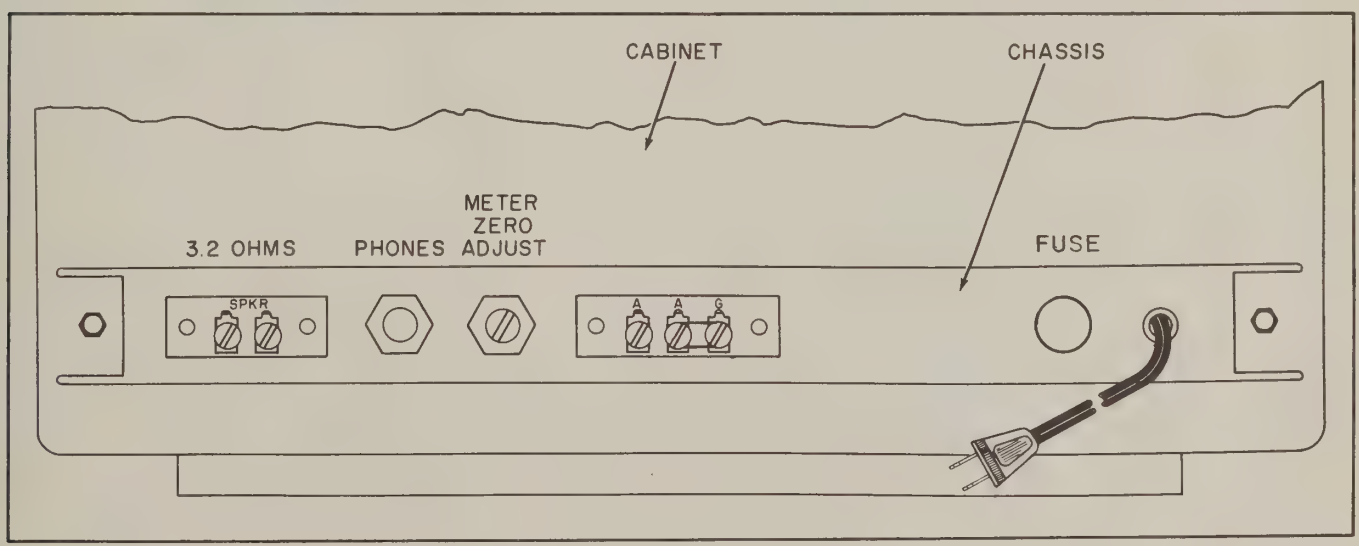
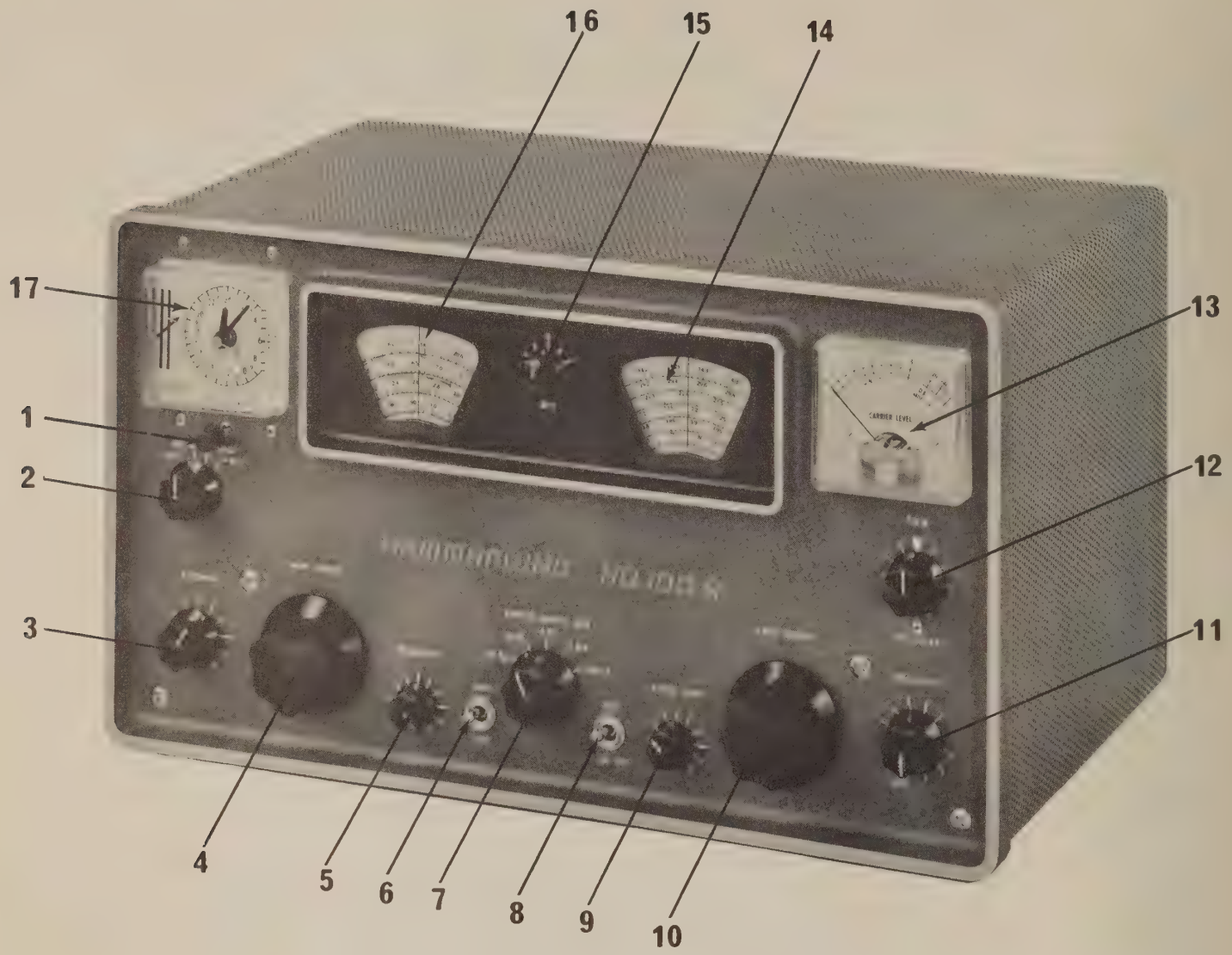



*Figure 4. Connection Points at Rear of Chassis*




| INDEX NO. | CONTROL | INDEX NO. | CONTROL |
|---|---|---|---|
| 1 | Automatic Clock-Timer Control | 9 | AUDIO GAIN Control |
| 2 | Function Switch | 10 | Electrical BAND SPREAD Control |
| 3 | ANTENNA Trimmer | 11 | SELECTIVITY Control, Q - Multiplier |
| 4 | MAIN TUNING Control | 12 | Frequency Control, Q - Multiplier |
| 5 | SENSITIVITY Control | 13 | "S" Meter |
| 6 | MAN. -AVC Switch | 14 | Electrical Band Spread Dial |
| 7 | Band Selector Switch | 15 | BFO Frequency Control |
| 8 | Noise Limiter Switch | 16 | Main Tuning Dial |
| | | 17 | Telechron Automatic Clock-Time. |

***Figure 5. Location of Controls***

# OPERATION

Basically, all that is necessary to operate a radio receiver are the tuning and volume controls. The additional controls found on the front panel of a communications receiver such as the HQ-100A, control functions which greatly improve operating performance and make possible reception of otherwise unintelligible signals.

## NORMAL CONTROL SETTINGS

For "normal" operation such as broadcast, short wave listening, etc., the position of the various controls should be as follows:

| | |
|---|---|
| Function Switch | Receive (REC.) |
| ANTENNA Trimmer | Tune for highest "S" meter reading on signal. |
| MAIN TUNING Control | Tune for highest "S" meter reading on signal. |
| SENSITIVITY Control | Fully clockwise |
| MAN.-AVC Switch | AVC |
| Band Selector (TUNING RANGE MCS) Switch | Set to desired frequency range. |
| Noise Limiter Switch | OFF |
| AUDIO GAIN Control | Adjust for proper level. |
| BAND SPREAD Control | Set counterclockwise to "100" on band spread dial. |
| SELECTIVITY Control | OFF |
| Frequency (FREQ.) Control | Set pointer to triangular marking. |

## CODE SIGNAL RECEPTION

For reception of code signals, the controls should be set as follows:

| | |
|---|---|
| Function Switch | BFO |
| ANTENNA Trimmer | Peak for maximum output on "S" meter. |
| MAIN TUNING Control | Peak for maximum output on "S" meter. |
| SENSITIVITY Control | Adjust for desired output level. |
| MAN.-AVC Switch | Manual (MAN.) |
| Band Selector (TUNING RANGE MCS) Switch | Set to desired frequency range. |
| Noise Limiter Switch | OFF or ON as required by local noise conditions. |
| AUDIO GAIN Control | 2/3 to 3/4 clockwise rotation. |
| SELECTIVITY Control | ON position |
| BFO FREQ Control | Tune signal to zerobeat with pointer on zero and then offset either left or right for desired pitch. |

## FUNCTION SWITCH

Three operating and an OFF position are provided. For AM reception the REC position is used. CW or SSB signals may be received with the FUNCTION switch on BFO. If the receiver is used with a transmitter the switch should be in the SEND position.

## SINGLE SIDE BAND OPERATION

The setting of the controls for Single Side Band reception is the same as for CW reception with the BFO being used for carrier reinsertion. The BFO frequency control should be set approximately 2-1/2 divisions to the left or right of the zero indice, depending upon whether the upper or lower sideband intelligence is desired. Final tuning should be accomplished with the BAND SPREAD control in order that proper speech registry be achieved.

## BAND SPREAD OPERATION

The BAND SPREAD control may be used for fine tuning by setting it at approximately 90 on the band spread

dial and tuning in the signal with the MAIN TUNING control. Final peaking of the signal is then accomplished by adjustment of the BAND SPREAD control. It should be understood that the setting of the BAND SPREAD control will affect the Main Dial calibration in that a higher frequency setting of the main tuning dial will be required. Rotating the band spread dial from 100 toward 0 tunes the receiver to a lower frequency.

For Band Spread operation in the amateur bands, the following procedure must be followed: The main tuning dial is set to the line marking the high frequency (right-hand end) of a given amateur band. The Band Spread tuning and calibration may then be accomplished solely with the BAND SPREAD control and dial.

## 20BS SWITCH POSITION

A separate switch position is provided on the TUNING RANGE control for spreading the 20-meter band. This switches in another band spread capacitor for optimum spreading of this band.

## TELECHRON AUTOMATIC TIMER

If your receiver is equipped with the built-in 24 hour Telechron Automatic Clock-Timer, the following instructions should be noted:

Every radio-frequency device is stable only at predetermined operating temperatures. In order to eliminate waiting for receiver to warm-up to operating temperature, the Telechron Timer automatically turns on the receiver ahead of anticipated operating time. This is accomplished by setting the hand of the timer (small knob at rear of receiver) to approximately one-half hour before operating hour. The front panel control under Timer is then set to "Auto" position. The function switch is set to REC. The receiver is then automatically turned on at the desired time.

The clock hands are set by the rear knob. Push in on the knob to set the switch timing hand and pull out on the knob to set the clock hands. The front switch is set to AUTO and the operation switch is set to REC. when it is desired to use the automatic clock switch for pre-warming the receiver before operation or for use as an alarm to turn the receiver on to a pre-tuned station. To use the operation switch normally, the clock switch should be left in the ON position.

The clock will continue to run as long as the receiver line cord is connected to the power outlet, and is extremely useful for checking sign-in periods and schedules.

If your receiver is not equipped with the Telechron Automatic Clock-Timer, and you would care to have the accessory added, clock kits, with full installation instructions, may be had by writing

Hammarlund Manufacturing Co.
73-88 Hammarlund Drive, Mars Hill, North Carolina
or by contacting the nearest Hammarlund dealer.

## POSSIBLE RECEIVER DIFFICULTIES

1. If, upon turning the function switch from "off" to "receive" position, the dials are not illuminated and the receiver fails to operate after two minutes, this indicates that the clock timer switch just above the function switch is not in the proper position. This switch should always be in the ON position unless auto timer is employed.

2. Excessive hum or failure of the Q multiplier to operate properly will usually be due to a defective 12AX7 type tube. Such a defective tube may test good in a tube tester but be unsatisfactory because of higher than normal heater-to-cathode leakage. Poor noise limiter action is usually due to a poor or defective 6BV8 type tube. The use of the noise limiter will result in some distortion which must be tolerated for most efficient noise limiting. Because of this,, when listening to broadcast stations or other strong local signals, the noise limiter switch should be in the "off" position unless the slight distortion is preferable to excessive pulse type noise, such as ignition interference.

3. Erratic S meter performance, lack of sufficient variation, etc., is usually due to the two 6BA6 tubes employed in the S meter circuit. These are the two 6BA6 tubes, V5 and V6, in the schematic diagram. Merely interchanging these tubes will sometimes provide sufficient improvement. Replacing one or both may be found advisable before suspecting other troubles.

4. Excessive drift, after allowing sufficient time for warm up, may be due to a poor type 6C4 tube, V3, in the diagram or 6BE6, V2, in the schematic diagram.

Ninety-nine percent of all receiver trouble has been found to be due to one or more defective tubes. This can undoubtedly be attributed to the rough handling equipments receive in shipment. Please, therefore, be sure to follow the above suggestions in addition to having all tubes tested before writing the Home Office.



To use 20 meter Bandspread, set Tuning range to 20 BS. If you set it on 10-30, you wont get the Correct Frequencies

# CIRCUIT THEORY

The HQ-100A basically a single conversion, four-band, superheterodyne receiver with a noise limiter. Its circuitry incorporates a Q-Multiplier for full control of selectivity and a stable, beat frequency oscillator.

## PRESELECTION

The antenna input coupling and RF amplifier stage provide the necessary preselection and gain for high performance and rejection of undesired signals. The high signal level at the mixer grid, V2, contributes to a favorable signal-to-noise ratio.

Both grid and plate circuits of the RF stage are tuned; individual tuning coils are selected for each band.

The antenna compensating compacitor, adjustable from the front panel, permits the receiver to be resonated for optimum performance with the particular antenna in use.

## CONVERTER STAGE

A high degree of oscillator stability is attained by the use of a separate mixer (6BE6), V2, and an independent oscillator (6C4), V3.

The output signal from RF amplifier V1 is heterodyned with the output of the local high frequency oscillator, V3, and electronically combined within the mixer tube, V2,. On the four frequency ranges the local oscillator is 455 KCS above the signal frequency.

Low-loss tube sockets, low-loss, phenolic temperature compensating capacitors, and stable, coaxial trimmers all contribute to oscillator stability. Additional frequency stability is attained by applying regulated voltage to the oscillator circuit and by the rugged construction of the entire HF oscillator section assembly.

## Q MULTIPLIER

The Q-Multiplier frequency control provides a means of peaking any signal within the pass band of the IF amplifier. The degree of peaking is controlled by the SELECTIVITY control. This same SELECTIVITY control when turned completely counter-clockwise disconnects the Q-Multiplier.

If interference is experienced, either between stations close to one another or from an interfering SW signal, gradually advance the Q-Multiplier selectivity control from its normally off or extreme counterclockwise position. This will result in increased selectivity by producing a spike of narrow bandwith that is adjustable from approximately 3 KCS to 100 cycles in width. The narrowest bandwith being obtained by adjustment of the Q-Multiplier selectivity control to the point just below that which would cause the Q-Multiplier to break into self-oscillation as evidenced by the receiver blocking with a resultant loss of volume.

The Q-Multiplier is generally never employed on the standard broadcast band or when short wave broadcast stations are being received. The use of the Q-Multiplier under these circumstances will only result in limiting the frequency response of the broadcast band and short wave broadcast stations in view of the very narrow band width that is provided by the Q-Multiplier. Of course, the SELECTIVITY control will make it possible to control this response characteristic. If, by chance, when receiving foreign short wave broadcast stations interference is experienced caused by two stations operating very close to one another, the Q-Multiplier may be employed under these circumstances to minimize, if not eliminate, the interference by the improved selectivity or decreased band width proper adjustment will provide. The proper use of the Q-Multiplier can actually enhance many times the result obtained with this receiver. In view of this, it is suggested that a little time be spent in learning just how to properly adjust the Q-Multiplier frequency and selectivity controls under different receiving conditions. As the Q-Multiplier SELECTIVITY control is advanced, a decided decrease in noise will be apparent. This is due to the narrowing of the pass band. On AM phone signals this control will usually be between the 7 and 11 o'clock positions. The FREQUENCY control should then be adjusted for clarity of signal or for minimum adjacent channel interference. The SELECTIVITY control may be advanced progressively more for SSB and CW reception. The more this control is advanced, the more critical the setting of the FREQUENCY control becomes. Advancing the SELECTIVITY control too far will cause the Q-Multiplier to oscillate. This should be avoided. The Q-Multiplier is a very handy tool in the hands of an experienced operator and, unfortunately, it is beyond the scope of this instruction manual to attempt to be more definite than we have.

## IF AMPLIFIER

Seven, stable tuned circuits, in two stages of IF amplification (V5 and V6), contribute to sensitivity and selectivity. Iron core permeability-tuned transformers improve performance and add to the ease of adjustment. The intermediate frequency is 455 KCS, the EIA standard.

## AVC SYSTEM

Automatic Volume Control minimizes fading and signal strength variations by controlling the gain of the RF stage V1 and the IF stage V5. As a result, a comfortable and constant level of audio is maintained.

## "S" METER (CARRIER LEVEL)

The "S", or Tuning, Meter is provided to assist in tuning and to give an indication of relative signal strength. Because the meter reading are proportional to AVC voltage, it is operative only in the AVC position.

The meter, which is calibrated to 40 db over S-9, is factory adjusted so that a signal input of approximately 50 microvolts gives a reading of S-9. Each "S" unit indicates a 6 db increase, equivalent to doubling signal strength. Should meter readjustment be necessary:

1. Set function switch to REC.
2. Set front panel SENSITIVITY control to "10" and Q-Multiplier SELECTIVITY control to OFF.
3. With receiver off, mechanically zero pointer with a fine screwdriver.
4. With AVC on and the ANT. terminals shorted, zero pointer with ZERO ADJ potentiometer R-15.

## DETECTOR AND NOISE LIMITER

One diode section of the 6BV8 tube, V7, is used for the second detector and AVC system. This system produced a minimum of distortion.

The other diode of V7 operates as a series, self-adjusting noise limiter. It will reduce automobile ignition and other types of impulse noise to a minimum. Intelligibility is not affected by the noise limiter, although it may be switched off if desired.

## BEAT FREQUENCY OSCILLATOR (BFO)

The BFO is activated by the FUNCTION switch for reception of CW or SSB signals or as an aid in locating weak SW broadcast stations. The BFO control is used under these conditions to vary the pitch. Each calibration division of this control represents approximately 1000 cycles. When receiving single side band transmission, the generally accepted procedure of setting the beat frequency oscillator approximately 1000 cycles above or below zero beat should be employed. In other words, if the beat frequency oscillator FREQ. control is set one degree clockwise or counterclockwise from the center position, optimum single side band reception will usually be obtained. Whether the beat frequency oscillator control will be set clockwise from zero beat will depend on whether upper or lower side band is being transmitted. If the beat frequency oscillator is on the wrong side of zero beat, it may be impossible to obtain intelligibility of the single side band signal when the band spread dial is tuned very slowly through the single side band sig-signal. Should such a condition arise, merely rotate the FREQ. control from the one degree counterclockwise to the one degree clockwise position and then very carefully adjust the BANDSPREAD for intelligible speech. The BFO frequency control may also be

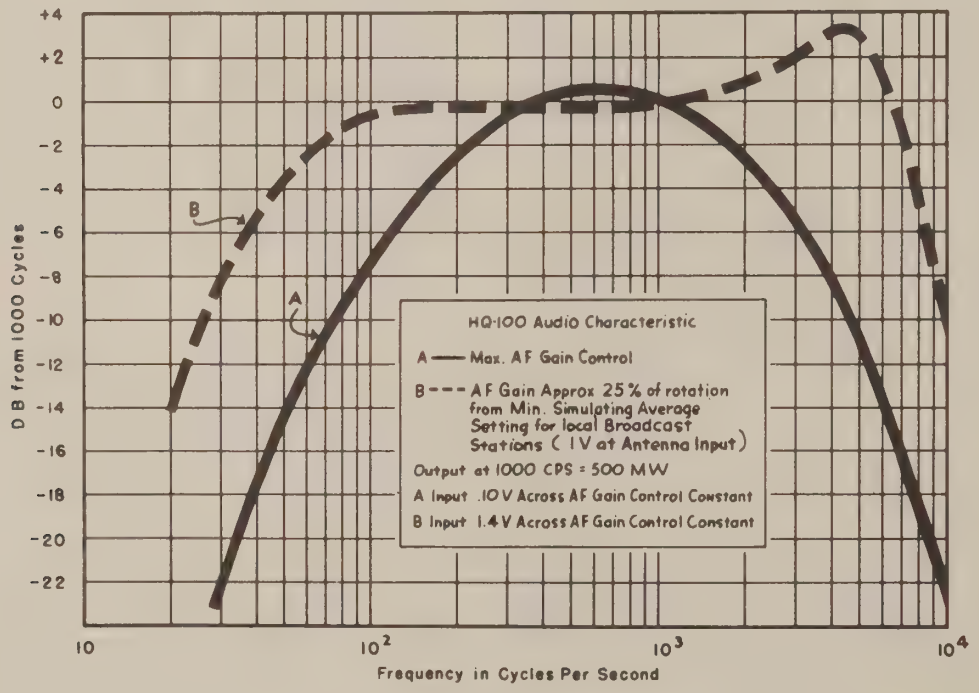



*Figure 6. Auto-Response Curve*

employed as a fine tuning adjustment to obtain desired speech quality. Here again experience is the best teacher. The stability of both the high frequency oscillator and the beat frequency oscillator employed in this receiver plus the excellent mechanical rigidity will provide excellent single side band reception. Refer to the paragraph on the Q-Multiplier operation for increase selectivity or narrowing of the passband usually permissable with CW and sideband reception.

It may be found desirable to place the function switch on BFO while tuning to aide in locating weak signals. As a result of activating the BFO, each carrier tuned in will produce a beat note or whistle easily discernable. If a phone signal is located in this manner, adjust the bandspread tuning control for the lower pitch tone or zero beat. This will result in centering the desired phone signal and now placing the function switch on REC will allow for normal AM operation.

## AUDIO AMPLIFIER

The first audio stage is a resistance coupled voltage amplifier employing the other section of the 12AX7 (V4B). The audio output stage is a 6AQ5 beam power amplifier (V8) providing an undistorted output level of at least one watt.

A feature of the audio system is the variable negative feedback employed (see Auto-Response Curve, Figure 6). Maximum feedback is provided at low settings of the AUDIO GAIN control for the fine quality reception of local broadcast and strong short wave stations. As the AUDIO GAIN control is increased, the feedback decreases so that on reception of weak signals additional selectivity is provided by the audio section. This results in an increased signal-to-noise ratio. A further advantage is the critical damping of the speaker for elimination of speaker "hangover". This upgrades the reception of speech and music and decreases the noise output of the receiver. A further advantage is the reduction of distortion at lower settings of the AUDIO GAIN control.

## ACCESSORIES

Now you can get even more out of your HQ-100A receiver!

The XC-100 Crystal Calibrator is available, providing checkpoints every 100 KCs within the range of the receiver.

The kit is quickly and easily installed. It is complete with easy-to-follow instructions, operating switch and mounting hardware.

This is not usually required by the average short wave listener, although it will prove an aid as a means of correcting for possible dial error.

The amateur operator will find this of most value since the 100 KCS checkpoints this unit provides, will make it possible to accurately set amateur band edges. This will result in improving the accuracy of the amateur band spread dial, by determining the exact setting of the main tuning dial.

# SERVICE AND REALIGNMENT PROCEDURE

NOTE

To service this receiver, disconnect from power source and remove all leadwires attached to terminal connections at rear of chassis apron. Carefully turn the receiver up onto the front panel face on a smooth clean surface. Remove the two #10 hex machine screws at the extreme ends of the chassis apron at the rear of the cabinet, and the knob from the clock adjustment shaft if receiver is so equipped. Lift cabinet straight up and off of chassis. To reassemble, use reverse procedure.

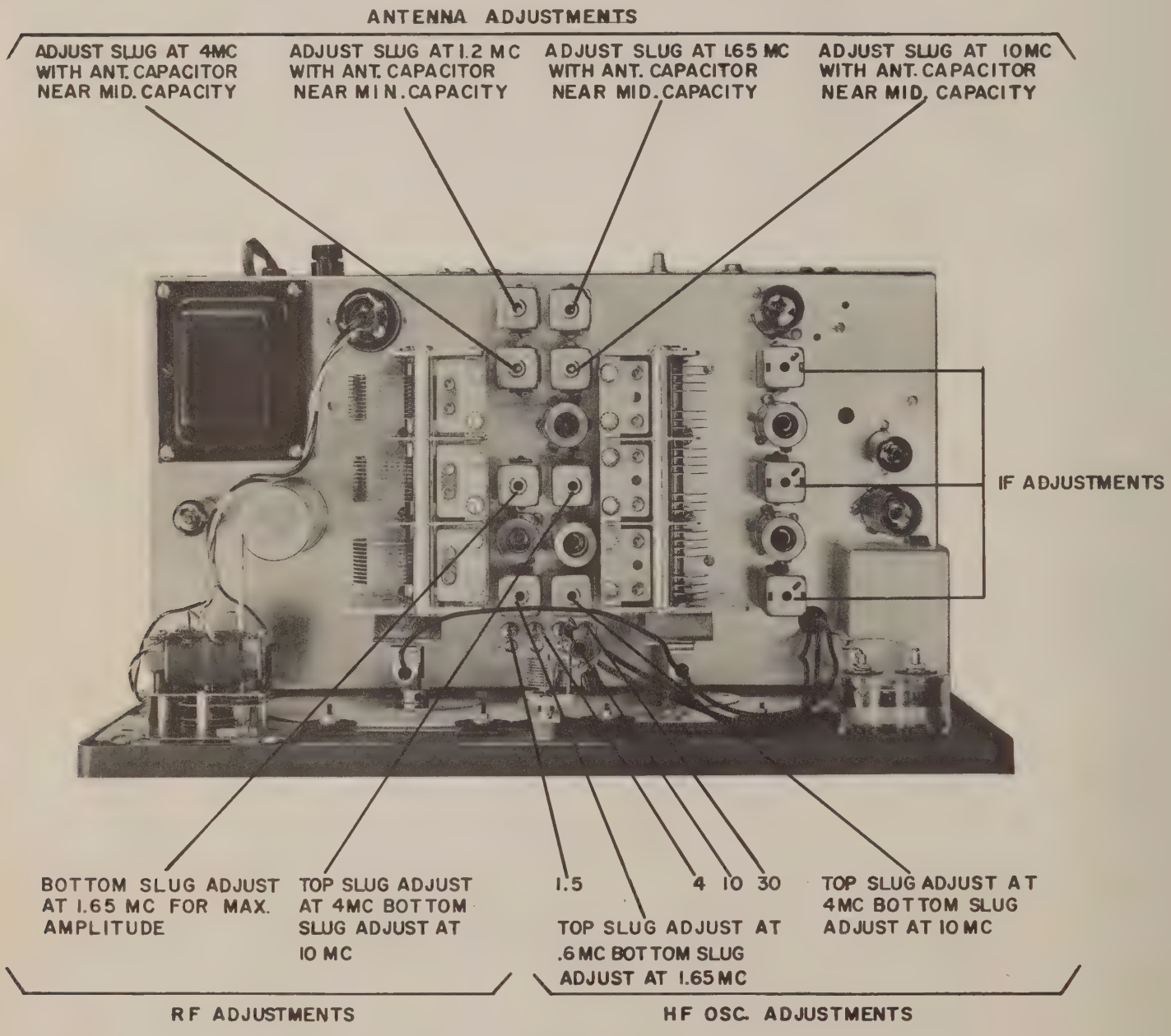



*Figure 7. Top View of Chassis*

## IF ALIGNMENT

NOTE

Use a non-metallic alignment tool such as General Cement Co. No. 5097, or equal.

a. Connect the output cable of a 455 KCS unmodulated, signal generator to the bus lead of the 6BE6 mixer grid. The frequency accuracy of the generator may be checked with sufficient precision by picking up its second harmonic (910 KCS) in any receiver whose calibration at 910 KCS has been checked as correct and then adjusting the generator frequency.

b. Connect a DC vacuum tube voltmeter, set for negative voltage reading to pin 8 of the V7, 6BV8 socket.

c. Set the receiver controls as follows:

BAND SPREAD dial on 100
Function switch on REC.
Main tuning dial on .54 MC
Noise limiter switch on OFF
AUDIO GAIN control at minimum
SELECTIVITY control on OFF
Band selector switch on .54 - 1.6 MC
MAN. -AVC switch on MAN.
SENSITIVITY control on 3 from maximum.

d. During alignment, adjust the generator output and the SENSITIVITY control to prevent overloading. Final adjustment should be made with the SENSITIVITY control at approximately the third indice from its maximum (clockwise) position. Adjust each of the three IF transformers for maximum meter reading. Topside adjustments (Figure 7) are secondaries or grid cir-

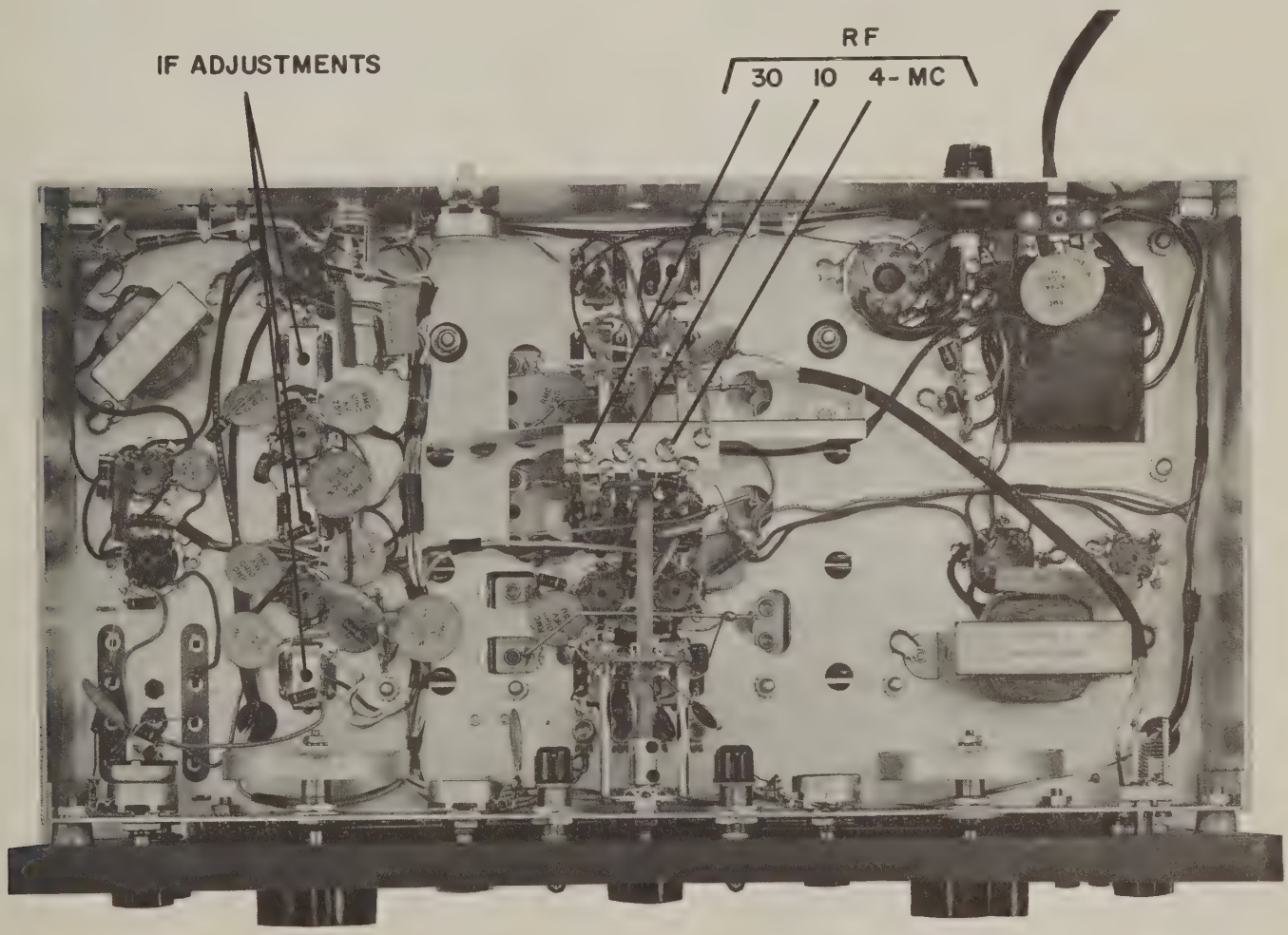



*Figure 8. Bottom View of Chassis*

cuits; bottom of chassis adjustments (Figure 8) are primaries or plate circuits.

e. Turn the Q-MULTI. ON and adjust the SELECTIVITY control clockwise to a position below the oscillating point. With its panel bushing nut loosened to permit the frequency shaft to turn without hindrance by the stop, adjust the FREQ. control to obtain a maximum meter indication. The input signal must be adjusted to a value just sufficient to obtain a good meter swing. This adjustment is the center frequency of the pass band. While the meter is at maximum, turn the stop lug to a position 180 degrees directly opposite the stop pin in the frequency shaft. Holding it in this position, tighten the bushing in the nut making sure that the shaft or the stop lug have not turned by checking the zero setting.

f. Turn FUNCTION switch to BFO. With the BFO frequency control on ZERO adjust the slug in L7 for ZERO beat with the AVC-MAN switch on MAN position and the SENSITIVITY control adjusted at a position below overload.

g. With the MAN. -AVC switch on AVC, the SENSITIVITY control at maximum, with grid pin 1 of the V5 amplifier tube grounded, and with no signal input, adjust the METER ZERO ADJUST. pot at the rear of the chassis (Figure 4) for a reading of zero on the "S" meter.

## RF ALIGNMENT

NOTE

Use a non-metallic alignment tool such as General Cement Co. No. 8282, or equal.

a. The slugs and trimmers, having been factory adjusted, should require a minimum amount of adjustment for any realignment.

b. All RF and oscillator slug adjustments are made from the top of the shield cans. See Figure 7.

c. Connect the unmodulated, signal generator output cable to the antenna and ground terminals of the receiver, with the A terminal adjacent to the G terminal jumped together. See Figure 4.

d. Set the controls the same as for IF alignment above. Adjust the SENSITIVITY control as required to obtain a sufficient voltmeter reading and to prevent overloading.

e. The oscillator adjustment is made first. The RF is adjusted next to obtain maximum amplitude. The antenna slugs are adjusted last. A certain amount of interaction will occur between the oscillator and RF adjustments, particularly on the higher frequency bands. Final adjustment should be accomplished by combined or alternate adjustment of the oscillator and RF for maximum amplitude.

NOTE

The trimmer adjustments, if required, should be the final adjustment for each band. See Figure 8 for location of trimmers.

There is no RF amplifier adjustment for the .54 - 1.6 MC band.

f. Note that the oscillator frequency in the HQ-100 is always on the high side of the signal frequency by 455 MCS. Therefore, it is necessary to make sure that the oscillator frequency is not adjusted below the signal frequency which would be an image response of the signal.

g. It will be necessary to repeat low and high end alignment adjustments of each band since the adjustments are interdependent. The process should be repeated until maximum amplitude is obtained at both alignment frequencies of each band.

NOTE

The receiver should be warmed up at least one-half hour before final oscillator frequency adjustments are made for the dial calibration check.

## DIAL CALIBRATION

a. Use a crystal calibrator having 100 KCS and 1000 KCS output. Set the arbitrary band spread dial scale to 100. Set the function switch to BFO. Set the BFO FREQ. control to zero. Set the SELECTIVITY control to OFF. Set the MAN. -AVC switch to MAN.

b. Check to see that the frequencies at or near the alignment frequencies are "on the line." If not, make minor adjustments of the slugs and trimmers (Figures 7 and 8) to make them correct.

CAUTION

Weaker signals will be observed at dial settings approximately 10 KCS above each calibration dial marking. These are image signals from 1 MC above the desired signal and may be recognized by their somewhat weaker strength and may be further reduced by proper adjustment of the gain controls. They will, of course, be more noticeable on the higher bands. Keeping the antenna tuned will help.

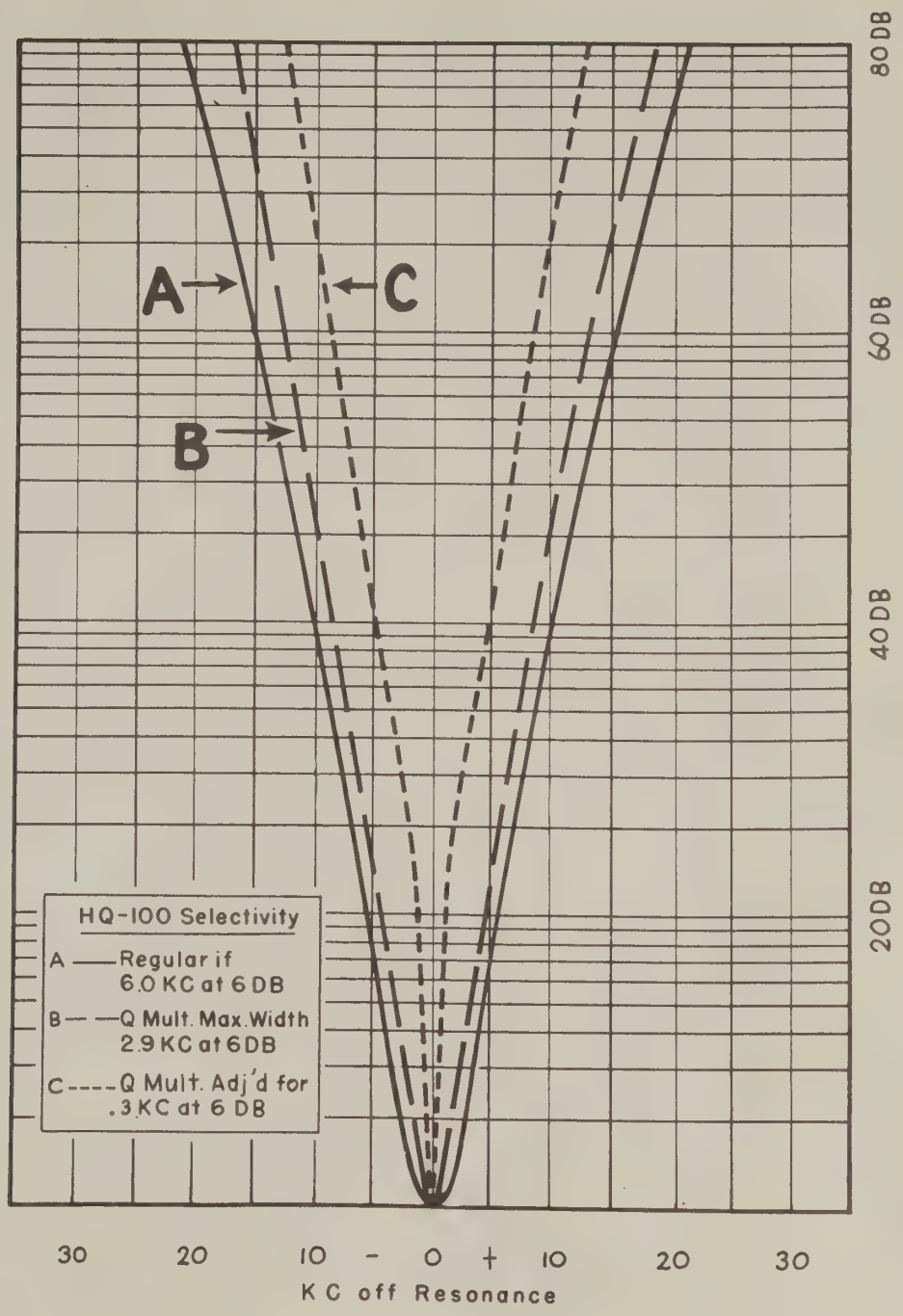



*Figure 9. Selectivity Curves*

TABLE 1. TUBE SOCKET VOLTAGES

MEASURED FROM TUBE SOCKET PINS TO CHASSIS WITH VTVM AUDIO GAIN MINIMUM. BAND SWITCH ON 10 TO 30 MC. LIMITER OFF. AVC-MAN SWITCH ON MAN. SENSITIVITY MAX. OPERATION SWITCH ON REC. Q-MULTIPLIER OFF. LINE VOLTAGE 117. NO SIGNAL INPUT.

| TUBE SOCKET NO. | SOCKET PIN NUMBERS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| V1 RF 6BZ6 | - | 1.8 | 6.3 AC | - | 210 | 105 | - | - | - |
| V2 MIXER 6BE6 | -6 | 1.3 | 6.3 AC | - | 205 | 70 | - | - | - |
| V3 HFO 6C4 | 90 | - | 6.3 AC | - | 90 | -3 TO -9 | - | - | - |
| V4 12AX7 Q MULT. 1st A-F | 90 | - | 1.5 | - | - | 60 | - | .5 | 6.3 AC |
| V5 1st IF 6BA6 | - | - | 6.3 AC | - | 200 | 100 | 2.2 12 MIN SENS | - | - |
| V6 2nd IF 6BA6 | - | - | 6.3 AC | - | 200 | 95 | 2.2 12 MIN SENS | - | - |
| V7 6BV8 DET LIM AVC BFO | - | -8 BFO ON | 110 BFO ON | 6.3 AC | 1.2 AC | -.2 -9 BFO ON | - | -.2 -9 BFO ON | -.3 -10 BFO |
| V8 6AQ5 AUDIO OUTPUT | - | 13 | 6.3 AC | - | 210 | 205 | - | - | - |
| V9 OA2 V-R | 105 | - | - | - | 105 | - | - | - | - |

TABLE 2. TUBE SOCKET RESISTANCES

BAND SWITCH ON 10-30 MC. MEASURED FROM TUBE SOCKET PINS TO CHASSIS. AUDIO GAIN MAXIMUM. OPERATIONS SWITCH ON REC. BFO OFF. LIMITER ON. SENSITIVITY MAXIMUM. AVC-MAN ON MAN.

| TUBE SOCKET NO. | SOCKET PIN NUMBERS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| V1 RF 6BZ6 | 10K 2.4M ON AVC | 180 | 0 | 0 | .5 MEG | .5 MEG | 0 | - | - |
| V2 MIXER 6BE6 | 22K | 180 | 0 | 0 | .5 MEG | .5 MEG | 0 | - | - |
| V3 HFO 6C4 | .5 MEG | INF | 0 | 0 | .5 MEG | 47K | 0 | - | - |
| V4 12AX7 Q MULT. 1st AF | .5 MEG | 2.2 MEG | 6800 16K SEL OFF | 0 | 0 | .5 MEG | 1 MEG | 2200 | 0 |
| V5 1st IF 6BA6 | 0 2.4M ON AVC | 0 | 0 | 0 | .5 MEG | .5 MEG | 180 10K MIN SENS | - | - |
| V6 2nd IF 6BA6 | 470K | 0 | 0 | 0 | .5 MEG | .5 MEG | 200 10K MIN SENS | - | - |
| V7 6BV8 DET LIM AVC BFO | 0 | 100K | .5 MEG BFO ON | 0 | 3.3 | 120 K | 0 | 2.2 MEG 100K LIM OFF | 190 K |
| V8 6AQ5 AUDIO OUTPUT | .5 MEG | 430 | 0 | 0 | .5 MEG | .5 MEG | .5 MEG | - | - |
| V9 OA2 V-R | .5 MEG | 0 | INF | 0 | .5 MEG | INF | 0 | - | - |

# PARTS LIST

| Schematic Designation | Description | Hammarlund Part No. |
|---|---|---|
| | CAPACITORS | |
| C1, A thru C | Variable, Main tuning | 9441-60-40003 |
| C2, A thru F | Variable, Bandspread | 9441-60-40004 |
| C3 | Variable, Antenna Compensator | 9434-45-40038 |
| C4, 5, 6, 7, 8, 9, 10, 15, 19, 30, 31, 32, 34, 35, 36, 41, 48 | Fixed, Ceramic disc .01 mf 1000V | 1509-01-01001 |
| C11, 12, 13 | Trimmer 1-8 mmf 500V | 1527-01-00001 |
| C16, 17, 18 | Fixed, silver mica, 100 mmf 500V | 1519-01-00001 |
| C20, 21, 22, 23 | Variable 1-8 mmf 500V | 1527-01-00002 |
| C24 | Fixed, silver mica 430 mmf 300V | 1519-02-03010 |
| C25 | Fixed, silver mica, 1300 mmf 500V | 1519-02-03011 |
| C26, 57 | Fixed, silver mica, 3000 mmf 500V | 1519-02-03009 |
| C27 | Fixed, silver mica, 1100 mmf 500V | 1519-01-03001 |
| C28 | Fixed, silver mica, 3300 mmf 500V | 1519-02-05001 |
| C29 | Fixed, silver mica, 510 mmf 500V | 1519-01-03002 |
| C33, 45, 46 | Fixed, Ceramic disc, .04 mf 600V | 1509-01-01005 |
| C38 | Fixed, Three-section electrolytic | 1517-01-00001 |
| C38A | 60 mf 450V (Part of 1517-01-00001) | |
| C38B | 40 mf 450V (Part of 1517-01-00001) | |
| C38C | 25 mf 50 V (Part of 1517-01-00001) | |
| C42 | Fixed, Ceramic disc, .005 mf 1000V | 1509-01-01003 |
| C43, 44 | Fixed, Ceramic disc, .01 mf 1400 V | 1509-01-01015 |
| C47 | Fixed, Discap, temperature compensating, 6.8 mmf | 1509-01-00022 |
| C49, 50 | Fixed, Discap, temperature compensating, 2.7 mmf | 1509-01-00001 |
| C51 | Fixed, Discap, temperature compensating, 6.8 mmf | 1509-02-00003 |
| C52 | Fixed, Ceramic, temperature compensating non-insulated, 1.5 mmf | 1509-01-02002 |
| C53 | Fixed, Silver mica 5 mmf 10% 500V | 1519-01-00003 |
| C54 | Fixed, Ceramic disc, 4.7 mmf 5% N220 | 1509-02-00024 |
| C55 | Fixed, Ceramic disc, .02 MFD 500V | 1509-01-01016 |
| C56 | Fixed, Silver mica 350 mmf, 20% 100V | 1519-02-00053 |
| C58 | Fixed, Silver mica 220 mmf 5% 500V | 1519-01-00007 |
| C59 | Variable | 9434-45-40038 |
| C60 | Fixed, Silver mica 2mmf±.5 mmf, 500V | 1519-01-00024 |
| | COILS | |
| L1 | R.F. Coil Assembly (Bands 1 and 2) | 1809-01-00005 |
| L2 | R.F. Coil Assembly (Bands 3 and 4) | 1811-01-00011 |
| L3 | H.F Osc. Coil Assembly (Bands 1 and 2) | 1809-01-00006 |
| L4 | H.F. Osc. Coil Assembly (Bands 3 and 4) | 1811-01-00012 |
| L5 | Coil and Ferrule Assembly | 9001-03-00118 |
| L6 | Choke, Filter, 13 Henries at 65 ma D.C. | 5626-02-00001 |
| L7 | BFO Coil | 1804-02-00055 |
| | RESISTORS | |
| R1, 32 | 22 Ohms, 1/2W | 4703-01-00312 |
| R2 | Potentiometer, 10,000 Ohms | 4735-02-00001 |
| R3 | 10,000 Ohms, 1/2W | 4703-01-00344 |
| R4, 10 | 1,000 Ohms, 1/2W | 4703-01-00332 |
| R5 | 22,000 Ohms, 1/2W | 4703-01-00348 |
| R6, 33 | 180 Ohms, 1/2W | 4703-01-00323 |
| R8 | 6,200 Ohms, 1/2W | 4703-02-00466 |
| R9, 34 | 47,000 Ohms, 1/2W | 4703-01-00352 |

# PARTS LIST

| Schematic Designation | Description | Hammarlund Part No. |
|---|---|---|
| | RESISTORS (continued) | |
| R11 | 2.2 Megohms, 1/2W | 4703-01-00372 |
| R12 | 6,800 Ohms, 1/2W | 4703-01-00342 |
| R13 | Potentiometer, 10,000 Ohms | 4735-01-08002 |
| R14, 16, 21, 29, 35 | 2,200 Ohms, 1/2W | 4703-01-00336 |
| R15 | Potentiometer, 200 Ohms | 4735-01-00200 |
| R17 | 1,600 Ohms, 1/2W 5% | 4703-02-00452 |
| R19 | 180 Ohms, 1/2W 5% | 4703-02-00429 |
| R20 | 4,000 Ohms, 10W | 4714-01-01002 |
| R27 | Potentiometer, 1 Meg | 4735-01-00002 |
| R28 | 47 Ohms, 1/2W | 4703-01-00316 |
| R30 | 100 Ohms, 1/2W | 4703-01-00320 |
| R31 | 430 Ohms, 1W | 4704-02-00738 |
| R36 | 10 Ohms, 1/2W | 4703-01-00308 |
| R37 | 470K Ohms 1/2W | 4703-01-00364 |
| R38 | 100K Ohms, 1/2W | 4703-01-00356 |
| R39 | 3.3 Ohms, 5W | 4713-01-00001 |
| R40 | 22 Ohms, 1W | 4704-01-00612 |
| | SWITCHES | |
| S1A, S1B | Switch Wafer RF | 5105-01-00007 |
| S1C | Switch Wafer HF Osc | 5106-02-00005 |
| S2 | Power-On-Off, SPST (Part of R13) | |
| S3 | OFF-REC BFO, Single Section, four position | 5106-02-00007 |
| S4 | MAN.-AVC, SPST | 5101-01-00001 |
| S5 | LIMITER, SPST | 5101-01-00001 |
| | TRANSFORMERS AND COIL ASSEMBLIES | |
| T1 | Antenna Transformer Assembly (Band 1) | 1809-01-00004 |
| T2 | Antenna Transformer Assembly (Band 2) | 1810-01-00010 |
| T3 | Antenna Transformer Assembly (Band 3) | 1811-01-00010 |
| T4 | Antenna Coil Assembly (Band 4) | 1812-01-00012 |
| T5, 6, 7 | Transformer, 1st, 2nd, and 3rd I.F. | 1811-01-00018 |
| T8 | Transformer, Output, Max power 5W, impedance match; 10,000 Ohms plate to 4 Ohms voice coil. | 5618-01-00002 |
| T9 | Transformer, Power, Primary 115V/230V 50-60 cps. | 5603-01-00011 |
| | MISCELLANEOUS | |
| CR1, 2 | Diode, Silicon CER72C | 4807-01-00001 |
| F1 | Fuse, 1 amp (115V Operation) | 5134-01-00201 |
| F1 | Fuse, 1/2 amp (230V operation) | 5134-01-00213 |
| I1, 2 | Lamp, pilot #47, 6.3V, .15A | 3901-01-00001 |
| J1 | Phone Jack | 2109-01-00001 |
| M1 | Meter "S" (Carrier Level) | 2902-01-00003 |
| P2 | Adapter (115V) | 9001-03-00028 |
| P2 | Adapter (230V) | 9001-03-00029 |
| | Telechron Clock Assembly (115V/60 cps) | 9207-01-00001 |
| | Telechron Clock Assembly (230V/60 cps) | 9207-01-00002 |
| | Telechron Clock Assembly (230V/50 cps) | 9207-01-00003 |
| | Crystal Calibrator XC-100 | 9205-00-00011 |

# ADDITIONAL HINTS FOR THE NOVICE AND SHORT WAVE LISTENER

A voltage reading of 45 - 50 volts may be obtained between the chassis and a ground as the result of the two power line by-pass condensers that are connected across the power line with the center tap grounded. Since we are dealing with AC, these capacitors will look like resistors to a volt meter. This will also produce a slight shock if the chassis is not grounded, and one happens to contact a grounded object, and the chassis or any exposed part of the receiver. This also will account for a slight spark, if the receiver is connected to the power line and the ground connection is made. For protection a good ground should always be employed.

In using the receiver for CW, or with the BFO, it is absolutely necessary to take the receiver out of the AVC position and put it into the Manual position. Failure to do this will result in the receiver blocking and erratic action of the S meter. The S meter is only usable in the AVC position. When using BFO, the audio control should be used at 2/3 to 3/4 rotation clockwise position and the RF sensitivity control employed as a means of adjusting volume.

When employing the Q multiplier for phone use the function switch will, of course, be in the REC position and it is advisable to start with the Q multiplier selectivity control in the 10 to 12 o'clock position. If this control is advanced past approximately the 2 o'clock position, the Q multiplier may go into oscillation resulting in the blocking of the receiver. For use on phone the Q multiplier selectivity control, will also usually be employed between maximum counter clock wise position and approximately straight up. Beyond this point or even at approximately the straight up position the receiver is usually so selective that it is capable of wiping the modulation off the carrier by actually rejecting the side bands. For normal phone use or broadcast reception the selectivity control should always be employed in the OFF counter clock wise position, since this results in the operation of a switch which disconnects the Q multiplier from the IF system.

If it is desirable to use the BFO to locate a station when tuning for weak signals, after the carrier is tuned in, merely rotate the function switch from the BFO position to the Receiver position which will result in turning off the BFO for phone reception. If interference is experienced either between stations close to one another, or an interfering CW signal, turn the Q multiplier selectivity control. Gradually advance the Q multiplier selectivity control which will result in increasing the selectivity by producing a spike of narrow band width that is adjustable from approximately 3 kc to 100 cycles in width. This spike can be moved around within the IF pass band that is nominally approximately 6 kc wide. The frequency control is the means for varying the position of this spike. Assuming that the selectivity control is adjusted to produce a spike 1 kc wide and also assuming that the band width of the IF system is 6 kc wide, it can be appreciated that the shape of the IF system response curve can be varied by moving the 1 kc band width anywhere within the 6 kc band width. This will produce a valley on either side of the spike or peak. By proper tuning, therefore, of the band spread dial and the frequency control of the Q multiplier, it should be apparent that an interfering signal may be placed in a valley and the desired signal on the peak, with the net result of decreasing the strength or eliminating the signal that is in the valley, without seriously affecting the desired signal intelligibility.

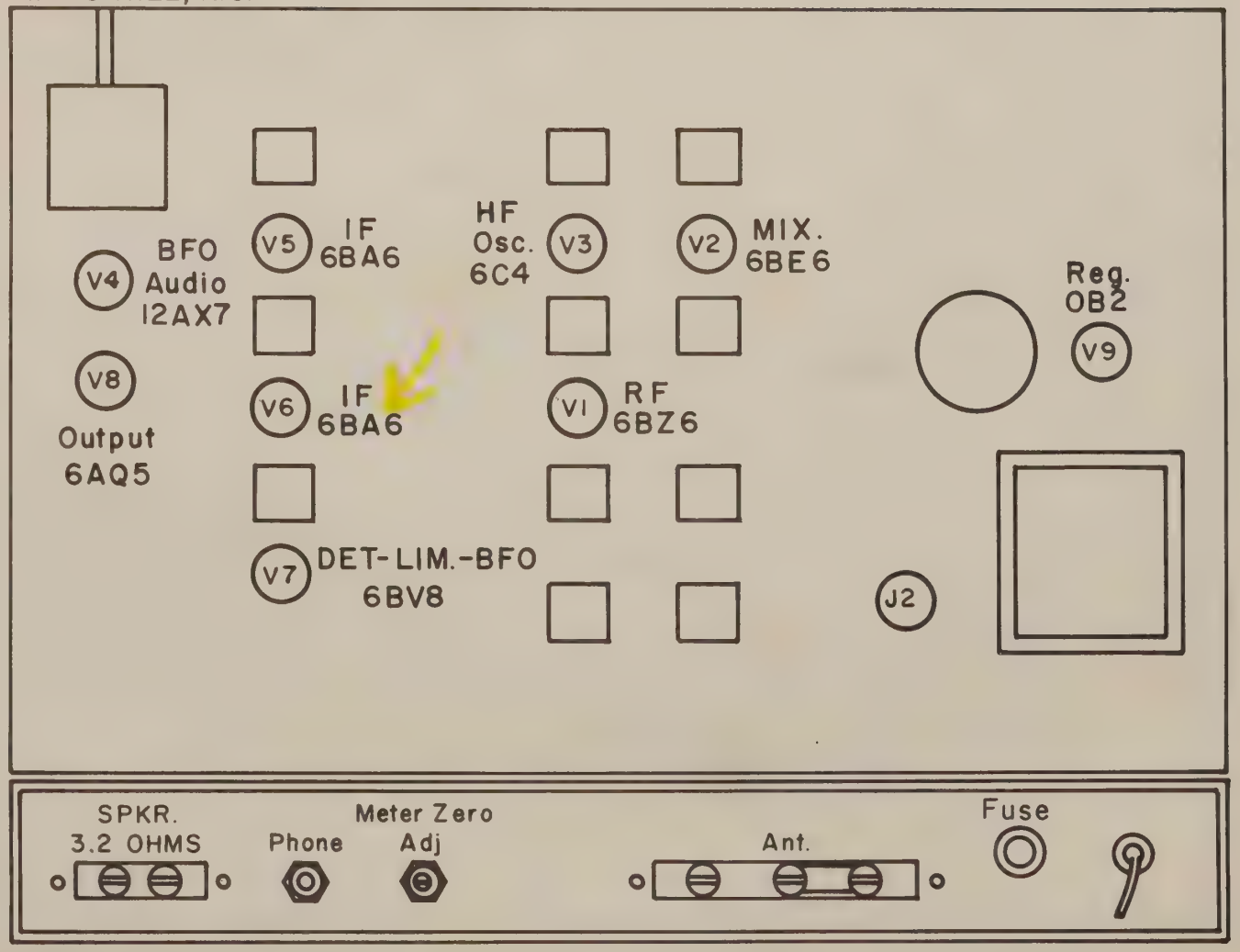
Since the use of the Q multiplier naturally means narrower band width, it should only be employed when interference is present. Never use the Q multiplier on the broadcast band unless you are hunting weak DX signals and are therefore not after maximum fidelity response. The same, more or less, applies to short wave broadcast listening. Here the use of the Q multiplier in addition to functioning as previously described may also prove advantageous from a noise reduction standpoint as a direct result of the decreased band width.

## MEMORANDA

# TUBE LOCATION

HAMMARLUND MFG. CO.
MARS HILL, N.C.

## MODEL NO. HQ-100A-




PT. 2418-02-00006

## HQ SERIES RECEIVERS

The XC-100 Calibrator Unit is designed so that it may be easily installed on the top of the tuning unit shield cover employing the mounting plate adaptor provided with the calibrator kit.

To install same in the HQ type receiver, remove the three screws at each side of the front panel and the three screws at the rear of the cabinet, then removing the receiver from the cabinet or rack.

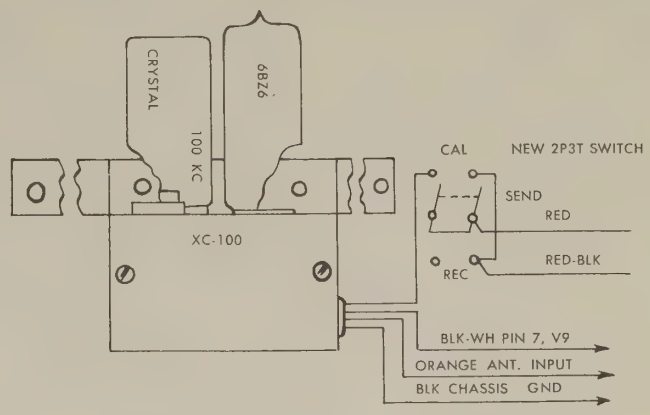
Remove the two rear screws of the tuning unit shield cover. Assemble the calibrator unit to the mounting plate adaptor provided with the kit, using the flat head screws, nuts and washers supplied.

Secure the assembly of the calibrator and adaptor bracket to the top of the tuning unit shield using the previously removed screws and with the lead wires turned toward the left side of the receiver viewed from the front.

Pass the four lead wires of the calibrator through the hole in the rear skirt of the chassis. Unsolder the two leads of the send-receive switch and remove this switch from the front panel of the receiver. Replace same with the new switch supplied with the calibrator kit, securing the new three position plate under the nut on the front panel.

Dress the wire leads of the unit to the correct length, strip and tin the ends to provide for conections as shown in the accompanying sketch. Make the electrical connections indicated in the sketch. Unsolder the lead wires of the receiver from the original send-receive switch and transfer the lead wires to the new switch installed. Make certain the switch is connected as shown, including the two jumper connections, which may be made with a portion of the wire cut off from the calibrator lead wires.

Replace the receiver in the cabinet or rack and replace the front panel screws. Note that the rear center screw should be omitted to avoid crushing of the calibrator lead wires. The two other back-side screws should be replaced.




Allow the normal warm-up time for the receiver and tune for a signal of known frequency, such as WWV at 5.0 mcs. and with the beat frequency oscillator of the receiver turned off, adjust the trimmer on the XC-100 calibrator for zero beat against the 5.0 mcs. signal. This should be done while the tone modulation of the standard frequency signal is off. No further adjustment of the XC-100 unit should be required under normal service conditions.

The calibrator in conjunction with the beat oscillator of the receiver should provide good signal strength at every 100 kcs. interval within the tuning range of the receiver.

The orange antenna lead wire from the calibrator is isolated within the unit by a series 8 mmf. capacitor and may be permanently connected to the antenna input of the receiver without affecting its normal performance.

## SP-600 SERIES RECEIVERS

The XC-100 Calibrator Unit is designed to mount under the two rear screws on the right side of the RF tube plate adjacent to the power transformer in all SP-600 receivers.

The crystal used in the calibrator has an operating temperature range of from minus 40 to plus 70 degrees C.

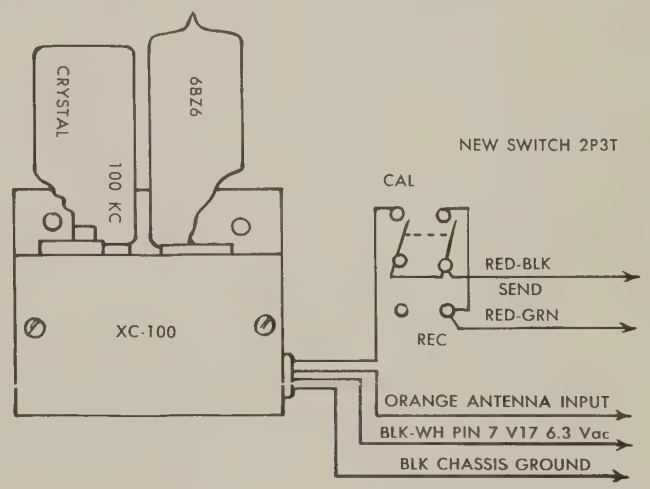
Assemble the calibrator unit to the mounting plate, employing the flat head screws, lock washers and nuts supplied with the kit. Carefully remove the 6BZ6 tube and crystal from the calibrator unit and remove the two screws from the RF tube plate. Secure the unit in position, using these same screws.

Pass the black-white, black and red wires of the unit down between the tuning unit and the chassis to the underside of the chassis. Keep the orange lead wire up and to the rear of the chassis for direct connection to the antenna input of the receiver.

Dress the wire leads of the unit to the required lengths, strip and tin the ends and solder the connections as follows:

Connect the black-white lead to Pin 7 of Socket V17, and the black lead to chassis ground. Connect the orange lead to the ungrounded side of the antenna input. This lead is isolated by a series 8 mmf. capacitor within the unit and may be left permanently connected to the antenna input without affecting the normal performance of the receiver.

Remove the send-receive switch, S9, from the front panel and carefully unsolder the two leads connected to it. Using these same leads and the red lead wire from the calibrator, connect the new two-pole, three position switch provided with the kit, as shown in the accompanying diagram. Note that for wiring this switch, the terminals are reversed in direction with respect to the switch handle. The red lead should be connected to the terminal on the opposite end from the keyway slot. After wiring the switch, install same with the new three-position switch plate under the nut on the front panel. Replace the tube and crystal in the calibrator.




Allow the normal warm-up time for the receiver and tune for a signal of known frequency, such as WWV at 5 mcs. and with the beat frequency oscillator turned off, adjust the trimmer on the XC-100 calibrator for zero beat against the 5.0 mcs. signal. This should be done while the tone modulation of the standard frequency signal is off.

Replace the receiver in its cabinet or rack. No further adjustment of the XC-100 unit should be required under normal service conditions.

The calibrator in conjunction with the beat oscillator of the receiver should provide good signal strength at every 100 kcs. interval within the tuning range of the receiver.

HAMMARLUND

**HAMMARLUND MANUFACTURING COMPANY, INC.,** 460 West 34th Street, New York 1, New York
International Division: 13 East 40th Street, New York 16, New York


4-25M-56
Bulletin No. APD-285

ESTABLISHED 1910

# IMPROVE PERFORMANCE WITH THE HAMMARLUND CRYSTAL CALIBRATOR


The new XC-100 Crystal Calibrator provides check points every 100 KCS within the range of the receiver. The XC-100 employs stable low-drift 100 KCS quartz crystal and 6BZ6 pentode. Trimmer capacitor provides adjustment for zero beat against primary frequency standard (WWV).

*Price:* HQ-100

*PL-38657-G1 General usage* — **$15.95**

*PL-38657-G2 for HQ-129-X and HQ-140-X* — **$17.95**

*PL-38657-G4 for SP-600* — **$17.95**

## *INSTRUCTIONS FOR INSTALLATION OF HAMMARLUND XC-100 CALIBRATOR IN HAMMARLUND HQ AND SP-600 SERIES COMMUNICATIONS RECEIVERS AND GENERAL COMMUNICATIONS RECEIVERS*

### GENERAL COMMUNICATIONS RECEIVERS

The XC-100 Calibrator Unit measures 1⅝" x 2" x 3⅛" high overall including tube and crystal. It may be mounted in any position or location where space is available on the receiver chassis. Avoid locations close to hot tubes

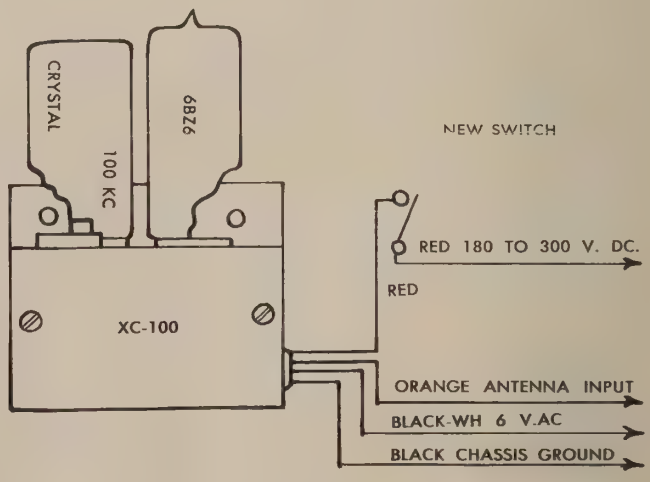
Two mounting holes, 1⅜" on centers, are provided in the flange of the calibrator shield cover. These holes will accommodate #6 machine screws.

Remove the receiver from its cabinet or rack and assemble the calibrator unit to the chassis. Locate and install the toggle switch furnished with the unit and its indicator switch plate on the front panel, or wherever desired.

Dress the wire leads of the unit to the correct length, strip and tin the ends to provide for connections as shown in the accompanying sketch. The portion cut from the red wire may be used to connect from the switch to the nearest point in the chassis where B+ potential is available. The toggle switch will mount in a 15/32 inch or ½ inch diameter hole.

Allow the normal warm-up time for the receiver and tune for a signal of known frequency, such as WWV at 5.0 mcs. and with the beat frequency oscillator of the receiver turned off, adjust the trimmer on the XC-100 calibrator for zero beat against the 5.0 mcs. signal. This should be done while the tone modulation of the standard frequency signal is off.

Replace the receiver in its cabinet or rack. No further adjustment of the XC-100 unit should be required under normal service conditions.




The calibrator in conjunction with the beat oscillator of the receiver should provide good signal strength at every 100 kcs. interval within the tuning range of the receiver.

The orange antenna lead wire from the calibrator is isolated within the unit by a series 8 mmf. capacitor and may be permanently connected to the antenna input of the receiver without affecting its normal performance.

Pin 5 OB2 (V9) B+ red

ground Pin 7 (V9) Black

6.3 (V2) White

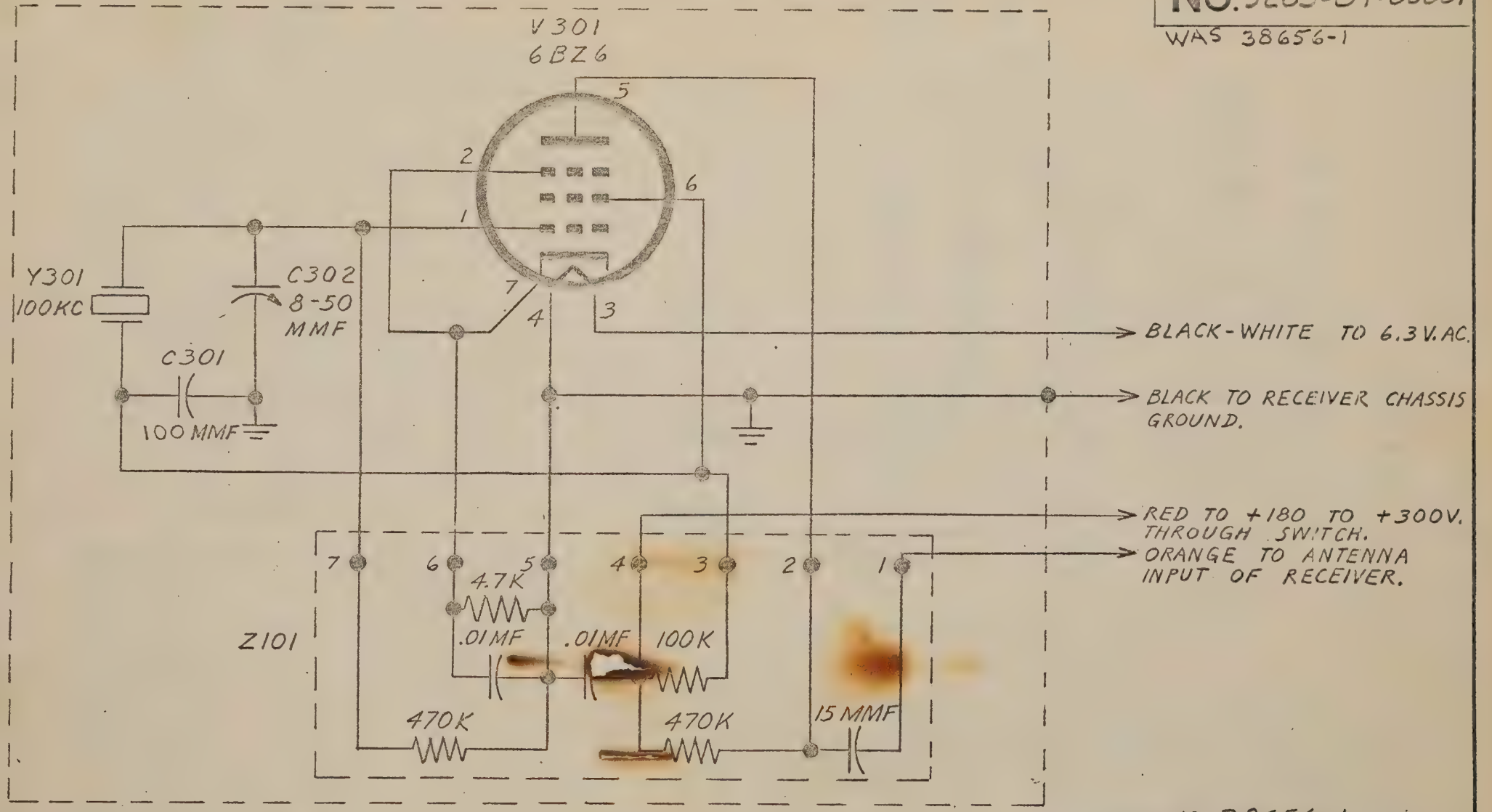
Pin 3 Center Orange

Red G1 6BE6 Pin 5 Black grd. chassis

White 1.3 6C4 Pin 3

ALL DIMENSIONS IN INCHES DO NOT SCALE THIS DRAWING

NO. 9205-04-00001
WAS 38656-1




OLD NO. 38656-1

| APP. | | PART NO. | ITEM | DESCRIPTION | MAT. | FIN. |
|---|---|---|---|---|---|---|

REVISIONS

| | APPROVED | | |
|---|---|---|---|
| 0 | 10-25-55 | | |
| 2 | 9/26/57 M. PALO | REDRAWN WITH RC PRINTED NETWORK ECN. 3025 | |
| 3 | | C301 WAS 220 MMF E.C.N. # 3485 10-28-58 J.C. | |
| 4 | 5-21-69 D.H. | 9205-04-00001 WAS 38656-1 | |

TOLERANCES
FRACTIONS: ±
DECIMALS: ±
ANGLES: ±
UNLESS OTHERWISE SPECIFIED
SCALE

TITLE: CIRCUIT DIAGRAM - XC-100
MATERIAL:
FINISH:

HAMMARLUND
NEW YORK

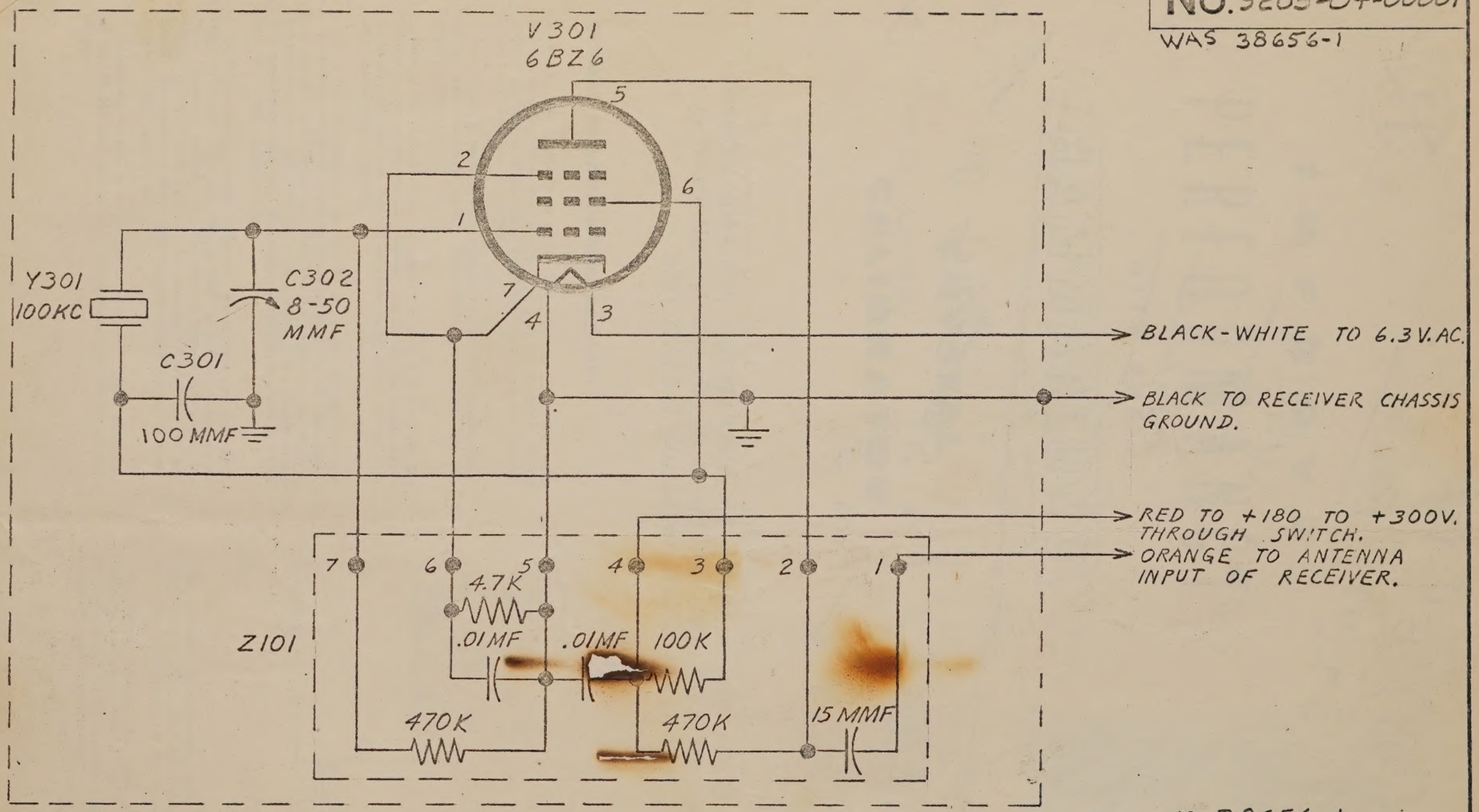
FIRST MADE FOR XC-100
DRAWN M. PALO
CHECKED
APPROVED

K

ALBANENE 195L 2637
TRACING PAPER

ALL DIMENSIONS IN INCHES DO NOT SCALE THIS DRAWING

NO. 9205-04-00001
WAS 38656-1

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TOLERANCES
FRACTIONS: ±
DECIMALS: ±
ANGLES: ±
UNLESS OTHERWISE SPECIFIED
SCALE

TITLE: CIRCUIT DIAGRAM - XC-100
MATERIAL:
FINISH:
FIRST MADE FOR XC-100
DRAWN M. PALO
CHECKED JCW
APPROVED GLF

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ALBANENE 1951 3637

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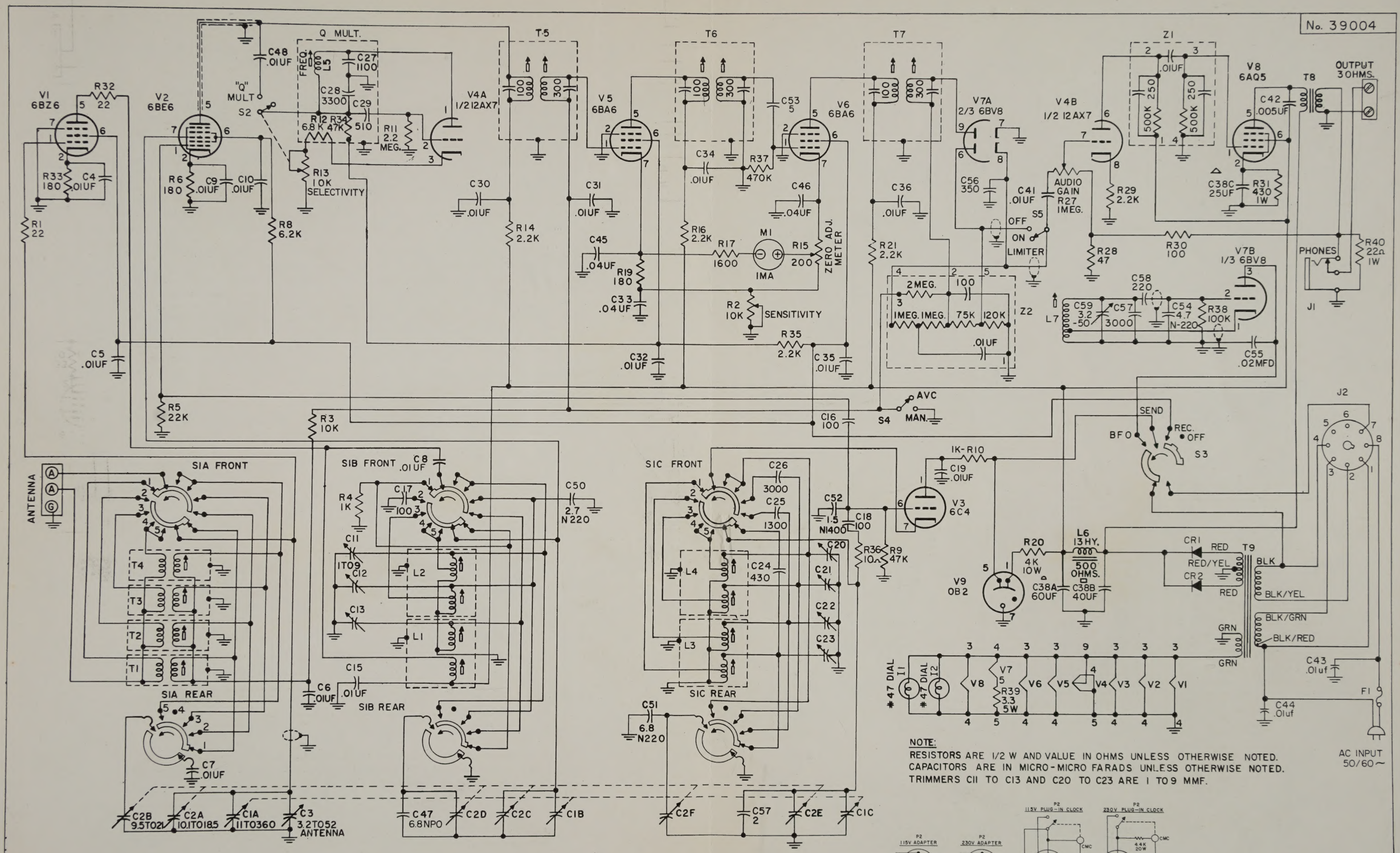


*Figure 10. Hammarlund HQ-100A Receiver, Schematic Diagram*

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